UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR, MI 48105

July 19, 2004

OFFICE OF
AIR AND RADIATION

MEMORANDUM

SUBJECT: Redline Version of 40 CFR Part 1048 Showing Proposed Changes

FROM: Alan Stout
Assessment and Modeling Division

TO: Docket OAR-2004-17

The attached document highlights the proposed changes to 40 CFR part 1048. Redline and strikeout text shows what we propose to add and remove from the current version of the regulation as published in the *Code of Federal Regulations*.

The redline document is intended to aid the reader in evaluating the proposed changes and making any appropriate comments. This full-text version should be entirely consistent with the proposed changes published in the *Federal Register*, but some deviations may occur. If there are any such differences, consider the version published in the *Federal Register* as the official proposal.

Attachment

PART 1048—CONTROL OF EMISSIONS FROM NEW, LARGE NONROAD SPARK-IGNITION ENGINES

Subpart ~~A—Determining How to Follow This Part~~A—Overview and Applicability

Sec.

Subpart B—Emission Standards and Related Requirements

Subpart C—Certifying Engine Families

Subpart D—Testing Production-line Engines

Appendix I to Part 1048—Large Spark-ignition (SI) Transient Cycle for Constant-Speed Engines

Appendix II to Part 1048—Large Spark-ignition (SI) Composite Transient Cycle

Authority: 42 U.S.C. 7401 - ~~7671(q)~~7671q.

Subpart ~~A—Determining How to Follow This Part~~A—Overview and Applicability

§1048.1 Does this part apply to me?

(a) ~~This~~The regulations in this part ~~applies to you if you manufacture or import~~1048 apply for all new, spark-ignition~~,~~ nonroad engines (defined in §1048.801) with maximum ~~brake~~engine power above 19 ~~kW, unless we exclude them under §1048.5. See §1048.20 for the requirements that apply to excluded engines.~~

~~(b) If you manufacture or import engines with maximum brake power at or below 19 kW that would otherwise be covered by 40 CFR part 90, you may choose to meet the requirements of this part instead. In this case, all the provisions of this part apply for those engines.~~

~~(c) As noted in subpart G of this part, 40 CFR part 1068 applies to everyone, including anyone who manufactures, installs, owns, operates, or rebuilds any of the engines this part covers or equipment containing these engines.~~

~~(d)~~kW, except as provided in §1048.5.

(b) This part 1048 applies for engines built on or after January 1, 2004. You need not follow this part for engines you produce before January 1, 2004~~, unless you certify voluntarily~~. See §§1048.101 through 1048.115~~ and~~, §1048.145, and the definition of model year in §1048.801 for more information about the timing of new requirements.

(~~c) See §§1048.801 and 1048.805 for definitions and acronyms that apply to this part.~~ c) The definition ~~section contains significant regulatory provisions and it is very important that you read them~~of nonroad engine in 40 CFR 1068.30 excludes certain engines used in stationary applications. These engines are not required to comply with this part, except for the requirements in §1048.20. In addition, if these engines are uncertified, the prohibitions in 40 CFR 1068.101 restrict their use as nonroad engines.

(d) In certain cases, the regulations in this part 1048 apply to engines with maximum engine power at or below 19 kW that would otherwise be covered by 40 CFR part 90. See 40 CFR 90.913 for provisions related to this allowance.

§1048.5 Which engines are excluded ~~or exempted~~ from this part's requirements?

~~(a)~~ This part does not apply to the following nonroad engines:

(~~1~~a) Engines that are certified to meet the requirements of 40 CFR part 1051, or are otherwise subject to 40 CFR part 1051 (for example, engines used in snowmobiles and all-terrain vehicles).

(~~2~~b) Propulsion marine engines. See 40 CFR part 91. This part applies with respect to auxiliary marine engines.

~~(b) See subpart G of this part and 40 CFR part 1068, subpart C, for exemptions of specific engines.~~

~~(c) Send the Designated Officer a written request if you want us to determine whether this part covers or excludes certain engines. Excluding engines from this part's requirements does not affect other requirements that may apply to them. (Note: See 40 CFR part 87 for engines used in aircraft.)~~

~~(d) As~~

§1048.10 How is this part organized?

The regulations in this part 1048 contain provisions that affect both engine manufacturers and others. However, the requirements of this part are generally addressed to the engine manufacturer. The term "you" generally means the engine manufacturer, as defined in §1048.801~~, stationary engines are not required to comply with this part (because they are not nonroad engines), except that you must meet the requirements in §1048.20. In addition, the prohibitions in 40 CFR 1068.101 restrict the use of stationary engines for non-stationary purposes.~~

~~**§1048.10 What main steps must I take to comply with this part?**~~

~~(a) You must have a certificate of conformity from us for each engine family before you do any of the following with a new nonroad engine covered by this part: sell, offer for sale, introduce into commerce, distribute or deliver for introduction into commerce, or import it into the United States. "New" engines may include some already placed in service (see the definition of "new nonroad engine" and "new nonroad equipment" in §1048.801). You must get a new certificate of conformity for each new model year.~~

~~(b) To get a certificate of conformity and comply with its terms, you must do six things:~~

~~(1) Meet~~. This part 1048 is divided into the following subparts:

(a) Subpart A of this part defines the applicability of part 1048 and gives an overview of regulatory requirements.

(b) Subpart B of this part describes the emission standards and other requirements ~~in subpart B of this part.~~

~~(2) Perform preproduction emission tests.~~

~~(3) Apply for certification (see subpart~~that must be met to certify engines under this part. Note that §1048.145 discusses certain interim requirements and compliance provisions that apply only for a limited time.

(c) Subpart C of this part~~).~~

~~(4) Do routine emission testing on production engines as required by s~~ describes how to apply for a certificate of conformity.

(d) Subpart D of this part~~:~~

~~(5) Do emission~~ describes general provisions for testing ~~on in-use~~production-line engines~~, as we direct under s~~.

(e) Subpart E of this part~~:~~

~~(6) Follow our instructions throughout this part~~ describes general provisions for testing in-use engines.

(~~c~~f)~~-~~ Subpart F of this part describes how to test your engines (including references to other parts of the Code of Federal Regulations).

(~~d~~g)~~-~~ Subpart G of this part and 40 CFR part 1068 describe requirements ~~and~~, prohibitions, and other provisions that apply to engine manufacturers, equipment manufacturers, owners, operators, rebuilders, and all others.

(h) [Reserved]

(i) Subpart I of this part contains definitions and other reference information.

§1048.15 Do any other regulation parts affect me?

(a) ~~-~~Part 1065 of this chapter describes procedures and equipment specifications for testing engines. Subpart F of this part 1048 describes how to apply the provisions of part 1065 of this chapter to ~~show your~~determine whether engines meet the emission standards in this part.

(b) The requirements and prohibitions of part 1068 of this chapter apply to everyone, including anyone who manufactures, imports, installs, owns, operates, or rebuilds any of the engines subject to this part 1048, or equipment containing these engines. Part 1068 of this chapter describes general provisions, including these seven areas:

(1) Prohibited acts and penalties for engine manufacturers, equipment manufacturers, and others.

(2) Rebuilding and other aftermarket changes.

(3) Exclusions and exemptions for certain engines.

(4) Importing engines.

(5) Selective enforcement audits of your production.

(6) Defect reporting and recall.

(7) Procedures for hearings.

(c) Other parts of this chapter affect youapply if referenced in this part.

§1048.20 What requirements from this part apply to my excluded engines?

(a) Engine manufacturers producing an engine excluded under §1048.5(d) stationary engines?

(a) You must add a permanent label or tag identifyingto each new engine. This applies equally to importers you produce or import that is excluded under §1048.1(c) as a stationary engine. To meet labeling requirements, you must do the following things:

(1) Attach the label or tag in one piece so no one can remove it without destroying or defacing it.

(2) Make sure it is durable and readable for the engine's entire life.

(32) Secure it to a part of the engine needed for normal operation and not normally requiring replacement.

(3) Make sure it is durable and readable for the engine's entire life.

(4) Write it in block letters in English.

(5) Instruct equipment manufacturers that they must place aFollow the requirements in §1048.135(g) regarding duplicate label as described in 40 CFR 1068.105labels if they obscure the engine's label is obscured in the final installation.

(b) Engine labels or tags required under this section must have the following information:

(1) Include the heading "Emission Control InformationEMISSION CONTROL INFORMATION".

(2) Include your full corporate name and trademark. You may instead include the full corporate name and trademark of another company you choose to designate.

(3) State the engine displacement (in liters) and maximum brakeengine power.

(4) State: "THIS ENGINE IS EXCLUDED FROM THE REQUIREMENTS OF 40 CFR PART 1048 AS A "STATIONARY ENGINE." INSTALLING OR USING THIS ENGINE IN ANY OTHER APPLICATION MAY BE A VIOLATION OF FEDERAL LAW SUBJECT TO CIVIL PENALTY.".

Subpart B—Emission Standards and Related Requirements

§1048.101 What exhaust emission standards must my engines meet?

Apply tThe exhaust emission standards inof this section apply by model year. You may choose to certify engines earlier than we require. The Tier 1 standards apply only to steady-state testing, as described in paragraph (b) of this section. The Tier 2 standards apply to steady-state, transient, and field testing, as described in paragraphs (a), (b), and (c) of this section.

(a) StandardsEmission standards for transient testing. Starting in the 2007 model year, Tier 2transient exhaust emissions from your engines may not exceed the Tier 2 emission standards apply for transient measurement of, as follows:

(1) Measure emissions ~~with~~using the ~~duty-cycle~~applicable transient test procedures described in subpart F of this part~~:~~.

(~~1~~2) The Tier 2 HC+NOx standard is 2.7 g/kW-hr and the Tier 2 CO standard is 4.4 g/kW-hr. For severe-duty engines, the Tier 2 HC+NOx standard is 2.7 g/kW-hr and the Tier 2 CO standard is 130.0 g/kW-hr. ~~The~~High-load engines and engines with maximum engine power above 560 kW are not subject to the transient standards in this paragraph (a)~~ do not apply for transient testing of high-load engines~~.

(~~2~~3) You may optionally certify your engines according to the following formula instead of the standards in paragraph (a)(1) of this section: $(HC+NOx) \times CO^{0.784} \leq 8.57$. The HC+NOx and CO emission levels you select to satisfy this formula, rounded to the nearest 0.1 g/kW-hr, become the emission standards that apply for those engines. You may not select an HC+NOx emission standard higher than 2.7 g/kW-hr or a CO emission standard higher than 20.6 g/kW-hr. The following table illustrates a range of possible values under this paragraph (a)(2):

Table 1 of §1048.101—
Examples of Possible Tier 2
Duty-cycle Emission Standards

HC+NOx (g/kW-hr)	CO (g/kW-hr)
2.7	4.4
2.2	5.6
1.7	7.9
1.3	11.1
1.0	15.5
0.8	20.6

(b) Standards for steady-state testing. Except as we allow in paragraph (d) of this section, ~~the following~~steady-state exhaust emissions from your engines may not exceed emission standards~~ apply for~~, as follows:

(1) Measure emissions using the applicable steady-state ~~measurement of emissions with the duty-cycle~~ test procedures described in subpart F of this part:

(~~1~~2) The following table shows the Tier 1 exhaust emission standards that apply to engines from 2004 through 2006 model years:

Table 2 of §1048.101—
Tier 1 Emission Standards (g/kW-hr)

Testing	General emission standards		Alternate emission standards for severe-duty engines	
	HC+NOx	CO	HC+NOx	CO
Certification and production-line testing	4.0	50.0	4.0	130.0
In-use testing	5.4	50.0	5.4	130.0

(~~2~~3) Starting in the 2007 model year, steady-state exhaust emissions from your engines ~~must meet~~may not exceed the ~~Tier 2 exhaust~~numerical emission standards in paragraph (a) of this section ~~for both steady-state and transient testing~~. See paragraph (d) of this section for alternate standards that apply for certain engines.

(c) Standards for field testing. Starting in 2007, ~~the following Tier 2~~ exhaust ~~emission~~emissions may not exceed field-testing standards ~~apply for emission measurements with~~, as follows:

(1) Measure emissions using the field-testing procedures in subpart F of this part:

(~~1~~2) The HC+NOx standard is 3.8 g/kW-hr and the CO standard is 6.5 g/kW-hr. For severe-duty engines, the HC+NOx standard is 3.8 g/kW-hr and the CO standard is 200.0 g/kW-hr. For natural gas-fueled engines, you are not required to measure nonmethane hydrocarbon emissions or total hydrocarbon emissions for testing to show that the engine meets the emission standards of this paragraph (c); that is, you may assume HC emissions are equal to zero.

(~~2~~3) You may apply the following formula to determine alternate emission standards that apply to your engines instead of the standards in paragraph (c)(1) of this section: $(HC+NOx) \times CO^{0.791} \leq 16.78$. HC+NOx emission levels may not exceed 3.8 g/kW-hr and CO emission levels may not exceed 31.0 g/kW-hr. The following table illustrates a range of possible values under this paragraph (c)(2):

Table 3 of §1048.101—
Examples of Possible Tier 2
Field-testing Emission Standards

HC+NOx (g/kW-hr)	CO (g/kW-hr)
3.8	6.5
3.1	8.5
2.4	11.7
1.8	16.8
1.4	23.1
1.1	31.0

(d) Engine protection. For engines that require enrichment at high loads to protect the engine, you may ask to meet alternate Tier 2 standards of 2.7 g/kW-hr for HC+NOx and 31.0 g/kW-hr for CO instead of the emission standards

described in paragraph (b)(2) of this section for steady-state testing. If we approve your request, you must still meet the transient testing standards in paragraph (a) of this section and the field-testing standards in paragraph (c) of this section. To qualify for this allowance, you must do all the following things:

(1) Show that enrichment is necessary to protect the engine from damage.

(2) Show that you limit enrichment to operating modes that require additional cooling to protect the engine from damage.

(3) Show in your application for certification that enrichment will rarely occur in use in the equipment in which your engines are installed. For example, an engine that is expected to operate 5 percent of the time in use with enrichment would clearly not qualify.

(4) Include in your installation instructions any steps necessary for someone installing your engines to prevent enrichment during normal operation (see §1048.130).

(e) Fuel types. ~~Apply t~~The exhaust emission standards in this section apply for engines using each type of fuel specified in 40 CFR part 1065, subpart C, ~~for~~on which ~~they~~the engines in the engine family are designed to operate, except for engines certified under §1048.625. For engines certified under §1048.625, the standards of this section apply to emissions measured using the specified test fuel. You must meet the numerical emission standards for hydrocarbons in this section based on the following types of hydrocarbon emissions for engines powered by the following fuels:

(1) Gasoline- and LPG-fueled engines: THC emissions.

(2) Natural gas-fueled engines: NMHC emissions.

(3) Alcohol-fueled engines: THCE emissions.

(f) Small engines. Certain engines with total displacement at or below 1000 cc may comply with the requirements of 40 CFR part 90 instead of complying with the requirements of this part, as described in §1048.615.

(g) Useful life. Your engines must meet the exhaust emission standards in paragraphs (a) through (c) of this section over their full useful life ~~(§1048.240 describes how to use deterioration factors to show this)~~. The minimum useful life is 5,000 hours of operation or seven years, whichever comes first. -

(1) Specify a longer useful life in hours for an engine family under either of two conditions:

(i) If you design, advertise, or market your engine to operate longer than the minimum useful life (your recommended hours until rebuild may indicate a longer design life).

(ii) If your basic mechanical warranty is longer than the minimum useful life.

(2) You may request in your application for certification that we approve a shorter useful life for an engine family ~~if you have documentation from in-use engines showing~~. We may approve a shorter useful life, in hours of engine operation but not in years, if we determine that these engines will rarely operate longer than the ~~alternate useful life~~shorter useful life. If engines identical to those in the engine family have already been produced and are in use, your demonstration must include documentation from such in-use engines. In other cases, your demonstration must include an engineering analysis of information equivalent to such in-use data, such as data from research engines or similar engine models that are already in production. Your demonstration must also include any overhaul interval that you recommend, any mechanical warranty that you offer for the engine or its components, and any relevant customer design specifications. Your demonstration may include any other relevant information. The useful life value may not be shorter than any of the following:

(i) 1,000 hours of operation.

(ii) Your recommended overhaul interval.

(iii) Your mechanical warranty for the engine.

(h) Applicability for testing. The emission standards in this subpart apply to all testing, including certification, production-line, and in-use testing~~, as described in subparts D and E of this part~~. For production-line testing, you must perform duty-cycle testing as specified in §§1048.505 and 1048.510. The field-testing standards of this section apply for those tests. You need not do additional testing of production-line engines to show that your engines meet the field-testing standards.

§1048.105 What evaporative emissions standards and requirements apply?

The requirements of this section apply to all engines that are subject to this part, except auxiliary marine engines.

(a) Starting in the 2007 model year, engines that run on a volatile liquid fuel (such as gasoline), must meet the following evaporative emissions standards and requirements:

(1) Evaporative hydrocarbon emissions may not exceed 0.2 grams per gallon of fuel tank capacity when measured with the test procedures for evaporative emissions in subpart F of this part.

(2) For nonmetallic fuel lines, you must specify and use products that meet the Category 1 specifications in SAE J2260 (incorporated by reference in §1048.810).

(3) Liquid fuel in the fuel tank may not reach boiling during continuous engine operation in the final installation at an ambient temperature of 30˚ C. Note that gasoline with a Reid vapor pressure of 62 kPa (9 psi) begins to boil at about 53˚ C.

(b) Note that §1048.245 allows you to use design-based certification instead of generating new emission data.

(c) If other companies install your engines in their equipment, give them any appropriate instructions, as described in §1048.130.

§1048.110 How must my engines diagnose malfunctions?

(a) Equip your engines with a diagnostic system. Starting in the 2007 model year, equip each engine with a diagnostic system that will detect significant malfunctions in its emission-control system using one of the following protocols:

(1) If your emission-control strategy depends on maintaining air-fuel ratios at stoichiometry, an acceptable diagnostic design would identify malfunction whenever the air-fuel ratio does not cross stoichiometry for one minute of intended closed-loop operation. You may use other diagnostic strategies if we approve them in advance.

(2) If the protocol described in paragraph (a)(1) of this section does not apply to your engine, you must use an alternative approach that we approve in advance. Your alternative approach must generally detect when the emission-control system is not functioning properly.

(b) Use a malfunction-indicator light (MIL). The MIL must be readily visible to the operator; it may be any color except red. When the MIL goes on, it must display “Check Engine,” “Service Engine Soon,” or a similar message that we approve. You may use sound in addition to the light signal. The MIL must go on under each of these circumstances:

(1) When a malfunction occurs, as described in paragraph (a) of this section.

(2) When the diagnostic system cannot send signals to meet the requirement of paragraph (b)(1) of this section.

(3) When the engine’s ignition is in the "key-on" position before starting or cranking. The MIL should go out after engine starting if the system detects no malfunction.

(c) Control when the MIL can go out. If the MIL goes on to show a malfunction, it must remain on during all later engine operation until servicing corrects the malfunction. If the engine is not serviced, but the malfunction does not

recur for three consecutive engine starts during which the malfunctioning system is evaluated and found to be working properly, the MIL may stay off during later engine operation.

(d) Store trouble codes in computer memory. Record and store in computer memory any diagnostic trouble codes showing a malfunction that should illuminate the MIL. The stored codes must identify the malfunctioning system or component as uniquely as possible. Make these codes available through the data link connector as described in paragraph (g) of this section. You may store codes for conditions that do not turn on the MIL. The system must store a separate code to show when the diagnostic system is disabled (from malfunction or tampering).

(e) Make data, access codes, and devices accessible. Make all required data accessible to us without any access codes or devices that only you can supply. Ensure that anyone servicing your engine can read and understand the diagnostic trouble codes stored in the onboard computer with generic tools and information.

(f) Consider exceptions for certain conditions. Your diagnostic systems may disregard trouble codes for the first three minutes after engine starting. You may ask us to approve diagnostic-system designs that disregard trouble codes under other conditions that would produce an unreliable reading, damage systems or components, or cause other safety risks. This might include operation at altitudes over 8,000 feet.

(g) Follow standard references for formats, codes, and connections. Follow conventions defined in the following documents (incorporated by reference in §1048.810) or ask us to approve using updated versions of (or variations from) these documents:

(1) ISO 9141-2 Road vehicles—Diagnostic systems— Part 2: CARB requirements for interchange of digital information, February 1994.

(2) ISO 14230-4 Road vehicles—Diagnostic systems—Keyword Protocol 2000— Part 4: Requirements for emission-related systems, June 2000.

§1048.115 What other requirements must my engines meet?

~~Your c~~Engines subject to this part must meet the following requirements:

(a) ~~Closed crankcase~~Crankcase emissions. ~~Your engines may not vent c~~Crankcase emissions may not be discharged directly into the ambient atmosphere ~~throughout their useful life, with the following exception: your engines may vent crankcase emissions if you measure and include these~~from any engine, except as follows:

(1) Engines may discharge crankcase emissions ~~with all measured~~to the ambient atmosphere if the emissions are added to the exhaust emissions (either physically or mathematically) during all emission testing.

(2) If you take advantage of this exception, you must do the following things:

(i) Manufacture the engines so that all crankcase emissions can be routed into the applicable sampling systems specified in 40 CFR part 1065.

(ii) Account for deterioration in crankcase emissions when determining exhaust deterioration factors.

(3) For purposes of this paragraph (a), crankcase emissions that are routed to the exhaust upstream of exhaust aftertreatment during all operation are not considered to be discharged directly into the ambient atmosphere.

(b) Torque broadcasting. Electronically controlled engines must broadcast their speed and output shaft torque (in newton-meters) on their controller area networks. Engines may alternatively broadcast a surrogate value for torque that can be read with a remote device. This information is necessary for testing engines in the field (see 40 CFR 1065.515). This requirement applies beginning in the 2007 model year. Small-volume engine manufacturers may omit this requirement.

(c) EPA access to broadcast information. If we request it, you must provide us any hardware or tools we would need to readily read, interpret, and record all information broadcast by an engine's on-board computers and

electronic control modules. If you broadcast a surrogate parameter for torque values, you must provide us what we need to convert these into torque units. We will not ask for hardware or tools if they are readily available commercially.

(d) Emission sampling capability. Produce all your engines to allow sampling of exhaust emissions in the field without damaging the engine or equipment. Show in your application for certification how this can be done in a way that prevents diluting the exhaust sample with ambient air. To do this, you might simply allow for extending the exhaust pipe by 20 cm; you might also install exhaust ports downstream of any aftertreatment devices.

(e) Adjustable parameters. Engines that have adjustable parameters must meet all the requirements of this part for any adjustment in the physically adjustable range.

(1) We do not consider aAn operating parameter is not considered adjustable if you permanently seal it or if it is not normally accessible using ordinary tools cannot readily access it.

(2) We may require that you set adjustable parameters to any specification within the adjustable range during any testing, including certification testing, production-line testing, selective enforcement auditing, or any in-use testing.

(f) Prohibited controls. You may not design your engines with emission-control devices, systems, or elements of design that cause or contribute to an unreasonable risk to public health, welfare, or safety while operating. For example, this would apply if the engine emits a noxious or toxic substance it would otherwise not emit that contributes to such an unreasonable risk.

(g) Defeat devices. You may not equip your engines with a defeat device. A defeat device is an auxiliary emission-control device that reduces the effectiveness of emission controls under conditions youthat the engine may reasonably expect the enginebe expected to encounter during normal operation and use. This does not apply to auxiliary emission-control-emission control devices you identify in your certification application if any of the following is true:

(1) The conditions of concern were substantially included in your prescribed duty cyclesthe applicable test procedures described in subpart F of this part.

(2) You show your design is necessary to prevent catastrophic engine (or equipment) damage or accidents.

(3) The reduced effectiveness applies only to starting the engine.

§1048.120 What emission-related warranty requirements apply to me?

(a) General requirements. You must warrant to the ultimate buyerpurchaser and each subsequent purchaser that the new nonroad engine, including all parts of its emission-control system, meets two conditions:

(1) It is designed, built, and equipped so it to conforms at the time of sale to the ultimate purchaser with the requirements of this part.

(2) It is free from defects in materials and workmanship that may keep it from meeting these requirements.

(b) Warranty period. Your emission-related warranty must be valid for at least 50 percent of the engine's useful life in hours of operation or at least three years, whichever comes first. In the case of a high-cost warranted part, the warranty must be valid for at least 70 percent of the engine's useful life in hours of operation or at least five years, whichever comes first. You may offer an emission-related warranty more generous than we require. ThisThe emission-related warranty for the engine may not be shorter than any published or negotiatedwarranty you offer without charge for the engine. Similarly, the emission-related warranty for any component may not be shorter than any published warranty you offer for the engine or any of its componentswithout charge for that component. If you provide an extended warranty to individual owners for any components covered in paragraph (c) of this section for

an additional charge, your emission-related warranty must cover those components for those owners to the same degree. If an engine has no hour meter, we base the warranty periods in this paragraph (b) only on the engine's age (in years). The warranty period begins when the engine is placed into service.

(c) Components covered. The emission-related warranty ~~must cover~~covers all components whose failure would increase an engine's emissions~~, including electronic controls, fuel injection (for liquid or gaseous fuels), exhaust-gas recirculation, aftertreatment, or~~ of any pollutant. This includes components listed in 40 CFR part 1068, Appendix I, and components from any other system you develop to control emissions. ~~We generally consider replacing or repairing other components to be the owner's responsibility.~~

~~(d) Scheduled maintenance. You may schedule~~The emission-related ~~maintenance for a component named in paragraph (c) of this section, subject to the restrictions of §1048.125. You are not required to cover this scheduled maintenance under your warranty if the component meets either of the following criteria:~~

~~(1) The component was in general use on similar engines, and was subject to scheduled maintenance, before January 1, 2000.~~

~~(2) Failure of the component would clearly degrade the engine's performance enough that the operator would need to repair or replace it.~~

~~(c~~warranty covers these components even if another company produces the component. Your emission-related warranty does not cover components whose failure would not increase an engine's emissions of any pollutant.

(d) Limited applicability. You may deny warranty claims under this section if the operator caused the problem through improper maintenance or use, as described in 40 CFR 1068.115.

(~~f~~e) ~~Aftermarket parts. As noted 40 CFR 1068.101, it is a violation of the Act to manufacture an engine part if one of its main effects is to reduce the effectiveness of the engine's emission controls. If you make an aftermarket part, you may—but do not have to—certify that using the part will still allow engines to meet emission standards, as described in 40 CFR 85.2114~~Owners manual. Describe in the owners manual the emission-related warranty provisions from this section that apply to the engine.

§1048.125 What maintenance instructions must I give to buyers?

Give the ultimate ~~buyer~~purchaser of each new nonroad engine written instructions for properly maintaining and using the engine, including the emission-control system. The maintenance instructions also apply to service accumulation on your ~~test~~emission-data engines, as described in 40 CFR part 1065~~, subpart E~~.

(a) Critical emission-related maintenance. Critical emission-related maintenance includes any adjustment, cleaning, repair, or replacement of critical emission-related components. This may also include additional emission-related maintenance that you determine is critical if we approve it in advance. You may schedule critical emission-related maintenance on these components if you meet the following conditions:

(1) You ~~may ask us to approve critical emission-related maintenance only if it meets two criteria:~~

~~(i) Operators are~~demonstrate that the maintenance is reasonably likely to ~~do the maintenance you call for.~~

~~(ii) Engines need the maintenance to meet emission standards.~~

~~(2)~~be done at the recommended intervals on in-use engines. We will accept scheduled maintenance as reasonably likely to occur ~~in use~~ if you satisfy any of ~~four~~the following conditions:

(i) You present data showing that, if a lack of maintenance increases emissions, it also unacceptably degrades the engine's performance.

(ii) You present survey data showing that at least 80 percent of engines in the field get the maintenance you specify at the recommended intervals.

(iii) You provide the maintenance free of charge and clearly say so in maintenance instructions for the customer.

(iv) You otherwise show us that the maintenance is reasonably likely to be done at the recommended intervals.

(~~3~~2) You may not schedule critical emission-related maintenance more frequently than the following minimum intervals, except as specified in paragraph (a)(~~4~~3), (b) and (c) of this section:

(i) For catalysts, fuel injectors, electronic control units, superchargers, and turbochargers: the useful life of the engine family.

(ii) For gaseous fuel-system components (cleaning without disassembly only) and oxygen sensors: 2,500 hours.

(~~4~~3) If your engine family has an alternate useful life under §1048.101(g) that is shorter than the period specified in paragraph (a)(~~3~~2)(ii) of this section, you may not schedule critical emission-related maintenance ~~on those components~~ more frequently than the alternate useful life, except as specified in paragraph (~~see §1048.101(g)~~)c) of this section.

(b) Recommended additional maintenance. You may recommend any additional amount of maintenance on the components listed in paragraph (a) of this section, as long as you ~~make~~state clearly that these maintenance steps are not necessary to keep the emission-related warranty valid. If operators do the maintenance specified in paragraph (a) of this section, but not the recommended additional maintenance, this does not allow you to disqualify ~~them~~those engines from in-use testing or deny a warranty claim. Do not take these maintenance steps during service accumulation on your emission-data engines.

(c) Special maintenance. You may specify more frequent maintenance to address problems related to special situations, such as substandard fuel or atypical engine operation. For example, you may specify more frequent cleaning of fuel system components for engines you have reason to believe will be using fuel that causes substantially more engine performance problems than commercial fuels of the same type that are generally available across the United States. You must clearly state that this additional maintenance is associated with the special situation you are addressing.

(d) Noncritical emission-related maintenance. You may schedule any amount of emission-related inspection or maintenance that is not covered by paragraph (a) of this section, as long as you state in the owners manual that these steps are not necessary to keep the emission-related warranty valid. If operators fail to do this maintenance, this does not allow you to disqualify those engines from in-use testing or deny a warranty claim. Do not take these inspection or maintenance steps during service accumulation on your emission-data engines.

(e) Maintenance that is not emission-related. For maintenance unrelated to emission controls, you may schedule any amount of inspection or maintenance. You may also take these inspection or maintenance steps during service accumulation on your ~~test vehicles or engines~~emission-data engines, as long as they are reasonable and technologically necessary. This might include adding engine oil ~~or~~, changing air, fuel, or oil filters, servicing engine-cooling systems, and adjusting idle speed, governor, engine bolt torque, valve lash, or injector lash. You may perform this nonemission-related maintenance on emission-data engines at the least frequent intervals that you recommend to the ultimate purchaser (but not the intervals recommended for severe service).

(f) Source of parts and repairs. ~~Print~~State clearly on the first page of your written maintenance instructions that ~~any~~ repair shop or person of the owner's choosing may maintain, replace, or repair emission-control devices and systems. Your instructions may not require components or service identified by brand, trade, or corporate name. Also, do not directly or indirectly condition your warranty on a requirement that the ~~vehicle~~equipment be serviced by your

franchised dealers or any other service establishments with which you have a commercial relationship.

You may disregard the requirements in this paragraph (f) if you do one of two things:

(1) Provide a component or service without charge under the purchase agreement.

(2) Get us to waive this prohibition in the public's interest by convincing us the engine will work properly only with the identified component or service.

(g) Payment for scheduled maintenance. Owners are responsible for properly maintaining their engines. This generally includes paying for scheduled maintenance. However, manufacturers must pay for scheduled maintenance during the useful life if it meets all the following criteria:

(1) Each affected component was not in general use on similar engines before January 1, 2004.

(2) The primary function of each affected component is to reduce emissions.

(3) The cost of the scheduled maintenance is more than 2 percent of the price of the engine.

(4) Failure to perform the maintenance would not cause clear problems that would significantly degrade the engine's performance.

(h) Owners manual. Explain the owner's responsibility for proper maintenance in the owners manual.

§1048.130 What installation instructions must I give to equipment manufacturers?

(a) If you sell an engine for someone else to install in a piece of nonroad equipment, give the ~~buyer of the~~ engine ~~written~~installer instructions for installing it consistent with the requirements of this part. Include all information necessary to ensure that ~~engines~~an engine will be installed ~~this way will meet emission standards~~in its certified configuration.

(b) Make sure these instructions have the following information:

(1) Include the heading: "Emission-related installation instructions".

(2) State: "Failing to follow these instructions when installing a certified engine in a piece of nonroad equipment violates federal law (40 CFR 1068.105(b)), subject to fines or other penalties as described in the Clean Air Act.".

(3) Describe ~~any other~~the instructions needed to ~~install an exhaust aftertreatment device and to locate exhaust sampling ports~~properly install the exhaust system and any other components. Include instructions consistent with ~~your application for certification~~the requirements of §1048.205(v).

(4) Describe the steps needed to control evaporative emissions, as described in §§1048.105 and 1048.245.

(5) Describe any necessary steps for installing the diagnostic system described in §1048.110.

(6) Describe any limits on the range of applications needed to ensure that the engine operates consistently with your application for certification. For example, if your engines are certified only for constant-speed operation, tell equipment manufacturers not to install the engines in variable-speed applications. Also, if you need to avoid sustained high-load operation to meet the field-testing emission standards we specify in §1048.101(c) or to comply with the provisions of §1048.101(d), describe how the equipment manufacturer must properly size the engines for a given application.

(7) Describe any other instructions to make sure the installed engine will operate according to design specifications in your application for certification. This may include, for example, instructions for installing aftertreatment devices when installing the engines.

(8) State: "If you install the engine in a way that makes the engine's emission control information label hard to read during normal engine maintenance, you must place a duplicate label on the ~~vehicle~~equipment, as described in 40 CFR 1068.105.".

(c) You do not need installation instructions for engines you install in your own equipment.

(d) Provide instructions in writing or in an equivalent format. For example, you may post instructions on a publicly available website for downloading or printing. If you do not provide the instructions in writing, explain in your application for certification how you will ensure that each installer is informed of the installation requirements.

§1048.135 How must I label and identify the engines I produce?

(a) Assign each ~~production~~ engine a unique identification number and permanently ~~and legibly~~ affix, engrave, or stamp it on the engine in a legible way.

(b) At the time of manufacture, ~~add~~affix a permanent ~~emission control information~~and legible label identifying each engine. T~~o meet labeling requirements, do four things:~~he label must be–

(1) ~~Attach the label~~Attached in one piece so it is not removable without being destroyed or defaced.

(2) ~~Design and produce it to be durable and readable for the engine's entire life.~~

~~(3)~~ Secure ~~it~~d to a part of the engine needed for normal operation and not normally requiring replacement.

(3) Durable and readable for the engine's entire life.

(4) ~~Write it in block letters~~ Written in English.

(c) ~~On your engine's emission control information~~The label~~, do 13 things:~~ must–

(1) Include the heading "EMISSION CONTROL INFORMATION".

(2) Include your full corporate name and trademark.

~~(3) State: "THIS ENGINE IS CERTIFIED TO OPERATE ON [specify operating fuel or fuels].".~~

~~(4) Identify the emission-control system; your identifiers must use names and abbreviations consistent with SAE J1930 (incorporated by reference in §1048.810).~~

~~(5) List all requirements for fuel and lubricants.~~

~~(6) State the date of manufacture [DAY (optional), MONTH, and YEAR], if you stamp this information on the engine and print it in the owner's manual, you may omit it from the emission control information label.~~

~~(7) State: "THIS ENGINE MEETS U.S. ENVIRONMENTAL PROTECTION AGENCY REGULATIONS FOR [MODEL YEAR] LARGE NONROAD SI ENGINES.".~~

~~(8)~~ You may identify another company and use its trademark instead of yours if you comply with the provisions of §1048.635.

(3) Include EPA's standardized designation for the engine family (and subfamily, where applicable).

(~~9~~4) State the engine's displacement (in liters) ~~and maximum brake power.~~

~~(10) State the engine's useful life (see §1048.101(g)).~~

~~(11~~; however, you may omit this from the label if all the engines in the engine family have the same per-cylinder displacement and total displacement.

(5) State the date of manufacture [MONTH and YEAR]. You may omit this from the label if you keep a record of the engine-manufacture dates and provide it to us upon request.

(6) Identify the emission-control system. Use terms and abbreviations consistent with SAE J1930 (incorporated by reference in §1048.810). You may omit this information from the label if there is not enough room for it and you put it in the owners manual instead.

(7) State: "THIS ENGINE IS CERTIFIED TO OPERATE ON [specify operating fuel or fuels].".

(8) Identify any requirements for fuel and lubricants. You may omit this information from the label if there is not enough room for it and you put it in the owners manual instead.

(9) List specifications and adjustments for engine tuneups; show the proper position for the transmission during

tuneup and state which accessories should be operating.

~~(12) Describe other information on proper maintenance and use.~~

~~(13)~~ You may omit this information from the label if there is not enough room for it and you put it in the owners manual instead.

(10) State the useful life for your engine family if it has a longer useful life under §1048.101(g)(1) or a shortened useful life under §1048.101(g)(2).

(11) Identify the emission standards to which you have certified the engine.

(12) State: "THIS ENGINE COMPLIES WITH U.S. EPA REGULATIONS FOR [MODEL YEAR] LARGE NONROAD SI ENGINES.".

~~(d) Some of your engines may need more information on the emission control information label.~~

~~(1) If you have an engine family that has been~~__

(13) If your engines are certified only for constant-speed operation, state: "USE IN CONSTANT-SPEED APPLICATIONS ONLY". ~~engines, add to the engine label "CONSTANT-SPEED ONLY".~~

~~(2) If you have an engine family that has been~~

(14) If your engines are certified only for variable-speed operation, state: "USE IN VARIABLE-SPEED APPLICATIONS ONLY". ~~engines, add to the engine label "VARIABLE-SPEED ONLY".~~

~~(3) If you have an engine family that has been~~

(15) If your engines are certified only for high-load engines, ~~add to the engine label~~state: "THIS ENGINE IS NOT INTENDED FOR OPERATION AT LESS THAN 75 PERCENT OF FULL LOAD.".

~~(4) If you certify an engine to the voluntary standards in §1048.140, add to the engine label "BLUE SKY SERIES".~~

~~(5) If you produce an engine we exempt from the requirements of this part, see subpart G of this part and 40 CFR part 1068, subparts C and D, for more label information.~~

(~~6~~16) If you certify ~~an engine family~~your engines under §1048.101(d) (and show in your application for certification that in-use engines will experience infrequent high-load operation), ~~add to the engine label~~state: "THIS ENGINE IS NOT INTENDED FOR OPERATION AT MORE THAN __ PERCENT OF FULL LOAD.". Specify the appropriate percentage of full load based on the nature of the engine protection. You may add other statements to discourage operation in engine-protection modes.

(~~c) Some engines may not have enough space for an~~17) If your engines are certified to the voluntary standards in §1048.140, state: "BLUE SKY SERIES".

(d) You may add information to the emission control information label ~~with all the required information. In this case, you may omit the information required in paragraphs (c)(3), (c)(4), (c)(5), and (c)(12) of this section if you print it in the owner's manual instead.~~

~~(f) If you are unable to meet these~~to identify other emission standards that the engine meets or does not meet (such as California standards). You may also add other information to ensure that the engine will be properly maintained and used.

(e) You may ask us to approve modified labeling requirements~~, you may ask us to modify them~~ in this part 1048 if you show that it is necessary or appropriate. We will approve your request if your alternate label is consistent with the ~~intent of this section~~requirements of this part.

(g) If you obscure the engine label while installing the engine in the equipment, you must place a duplicate label on the equipment. If others install your engine in their equipment in a way that obscures the engine label, we require them to add a duplicate label on the equipment (see 40 CFR 1068.105); in that case, give them the number of

duplicate labels they request and keep the following records for at least five years:

(1) Written documentation of the request from the equipment manufacturer.

(2) The number of duplicate labels you send and the date you sent them.

§1048.140 What are the provisions for certifying Blue Sky Series engines?

This section defines voluntary standards for a recognized level of superior emission control for engines designated as "Blue Sky Series" engines. Blue Sky Series engines must meet one of the following standards:

(a) For the 2003 model year, to receive a certificate of conformity, a "Blue Sky Series" engine family must meet all the requirements in this part that apply to 2004 model year engines. This includes all testing and reporting requirements.

(b) For the 2003 through 2006 model years, to receive a certificate of conformity, a "Blue Sky Series" engine family must meet all the requirements in this part that apply to 2007 model year engines. This includes all testing and reporting requirements.

(c) For any model year, to receive a certificate of conformity as a "Blue Sky Series" engine family must meet all the requirements in this part~~;~~ while certifying to one of the ~~following~~sets of exhaust emission standards~~:~~

~~(1) 0.8 g/kW-hr HC+NOx and 4.4 g/kW-hr CO using~~ in the following table:

Table 1 of §1048.140—Long-term Standards for Blue Sky Series Engines (g/kW-hr)

Level	Standards for steady-state and transient test procedures~~, as described in subpart F of this part.~~ ~~(2) 1.1 g/kW-hr HC+NOx and 6.6 g/kW-hr CO using~~		Standards for field-testing procedures~~, as described in subpart F of this part~~	
	HC+NOx	CO	HC+NOx	CO
Blue Sky	0.80	4.4	1.10	6.6
Advanced Blue Sky	0.30	3.0	0.42	4.5
Premium Blue Sky	0.15	3.0	0.21	4.5

(d) If you certify an engine family under this section, it is subject to all the requirements of this part as if these voluntary standards were mandatory.

§1048.145 ~~What~~Are there interim provisions that apply only for a limited time?

The provisions in this section apply instead of other provisions in this part. This section describes when these interim provisions expire.

(a) Family banking. ~~You may certify an engine family to comply with Tier 1 or Tier 2 standards earlier than necessary. For each model year of early compliance for an engine family, you may delay compliance with the same standards for an equal~~This paragraph (a) allows you to reduce the number of engines ~~from another engine family (or families) for one model year.~~ subject to the Tier 2 standards by certifying some of your engines earlier than otherwise required, as follows:

(1) For early-compliant engines to generate offsets under this paragraph (a), you must meet the following

general provisions:

(i) You must begin actual production of early-compliant engines by September 1, 2006.

(ii) Engines you produce after December 31, 2006 may not generate offsets.

(iii) Offset-generating engines must be certified to the Tier 2 standards and requirements under this part 1048.

(iv) If you certify engines under the voluntary standards of §1048.140, you may not use them in your calculation under this paragraph (a). ~~Base your calculation on actual nationwide sales for each family. You may delay compliance for up to three model years~~

(2) For every offset-generating engine certified to the Tier 2 standards, you may reduce the number of engines with the same maximum engine power that are required to meet the Tier 2 standards in later model years by one engine. You may calculate power-weighted offsets based on actual U.S.-directed sales volumes. For example, if you ~~sell~~produce a total of 1,000 engines in 2005 and 2006 with an average maximum power ~~rating~~ of 60 kW certified ~~a year early~~to the Tier 2 standards, you may delay certification to that tier of standards for up to 60,000 kW-engine-years in any of the following ways:

(~~1~~i) Delay certification of ~~another engine family~~up to 600 engines with an average maximum power ~~rating~~ of 100 kW ~~of up to 600 engines~~ for one model year.~~–~~

~~(2)~~ (ii)Delay certification of up to 200 engines with an average maximum power of 100 kW for three consecutive model years.

(iii) Delay certification of ~~another engine family~~up to 400 engines with an average ~~power rating of 100 kW of up to 200 engines for three model years.~~

~~(3) Delay certification of one engine family with an average power rating of 100 kW of up to 400 engines~~maximum power of 100 kW for one model year and ~~a second engine family~~up t o50 engines with an average maximum power ~~rating~~ of 200 kW ~~of up to 50 engines~~ for two model years.

(3) Offset-using engines (that is, those not required to certify to the Tier 2 standards) must be certified to the Tier 1 standards and requirements of this part 1048. You may delay compliance for up to three model years.

(4) By January 31 of each year in which you use the provisions of this paragraph (a), send us a report describing how many offset-generating or offset-using engines you produced in the preceding model year.

(b) Hydrocarbon standards. For 2004 through 2006 model years, engine manufacturers may use nonmethane hydrocarbon measurements to demonstrate compliance with applicable emission standards.

(c) ~~Transient emission testing. Engines rated over 560 kW are exempt from the transient emission standards in §1048.101(a).~~ [Reserved]

(d) Tier 1 deterioration factors. For Tier 1 engines, base the deterioration factor from §1048.240 on 3500 hours of operation. We may assign a deterioration factor for a Tier 1 engine family, but this would not affect your need to meet all emission standards that apply.

(e) [Reserved]

(f) Optional early field testing. You may optionally use the field-testing procedures in subpart F of this part for any in-use testing required under subpart E of this part to show that you meet Tier 1 standards. In this case, the same Tier 1 in-use emission standards apply to both steady-state testing in the laboratory and field testing.

(g) Small-volume provisions. If you qualify for the hardship provisions in §1068.250 of this chapter, we may approve extensions of up to four years total.

(h) 2004 certification. For the 2004 model year, you may choose to have the emission standards and other requirements that apply to these engines in California serve as the emission standards and other requirements

applicable under this part, instead of those in subpart A of this part. To ask for a certificate under this paragraph (h), send us the application for certification that you prepare for the California Air Resources Board instead of the information we otherwise require in §1048.205.

(i) Recreational vehicles. Engines or vehicles identified in the scope of 40 CFR part 1051 that are not yet regulated under that part are excluded from the requirements of this part. For example, snowmobiles produced in 2004 are not subject to the emission standards in this part. Once emission standards apply to these engines and vehicles, they are excluded from the requirements of this part under §1048.5(a)(1).

Subpart C—Certifying Engine Families

§1048.201 What are the general requirements for submittingobtaining a certification applicationcertificate of conformity?

(a) SYou must send us ana separate application for a certificate of conformity for each engine family. Each application is valid for only one model year.

(b) A certificate of conformity is valid from the indicated effective date until December 31 of the model year for which it is issued.

(b) The application must contain all the information required by this part and must not include false or incomplete statements or information (see §1048.255).

(c) We may choose to ask you to send usinclude less information than we specify in this subpart, but this would not change your recordkeeping requirements.

(d) Useas long as you maintain all the information required by §1048.250.

(d) You must use good engineering judgment for all decisions related to your application (see 40 CFR 1068.5).

(e) An authorized representative of your company must approve and sign the application.

(f) See §1048.255 for provisions describing how we will process your application.

(g) We may require you to deliver your test engines to a facility we designate for our testing (see §1048.235(c)).

§1048.205 What must I include in my application?

IThis section specifies the information that must be in your application, do all the following things unless we ask you to send usinclude less information under §1048.201(c). We may require you to provide additional information to evaluate your application.

(a) Describe the engine family's specifications and other basic parameters of the engine's design and emission controls. List the fuel types of fuel you intend to use to certify then which your engine families are designed to operate (for example, gasoline, liquefied petroleum gas, methanol, or natural gas). and natural gas). List each distinguishable engine configuration in the engine family.

(b) Explain how the emission-control systems operates.

(1) Describe in detail all the system components for controlling exhaust emissions, including all auxiliary emission-control-emission control devices (AECDs) and all fuel-system components you will install on any production or test engine. Explain why any auxiliary emission-control devices are not defeat devices (see §1048.115(g)). Do not include detailed calibrations for components unless we ask for them.

(2) Describe the evaporative emission controls. Identify the part number of each component you describe. For

this paragraph (b), treat as separate AECDs any devices that modulate or activate differently from each other. Include all the following:

(1) Give a general overview of the engine, the emission-control strategies, and all AECDs.

(2) Describe each AECD's general purpose and function.

(3) Identify the parameters that each AECD senses (including measuring, estimating, calculating, or empirically deriving the values). Include equipment-based parameters and state whether you simulate them during testing with the applicable procedures.

(4) Describe the purpose for sensing each parameter.

(5) Identify the location of each sensor the AECD uses.

(6) Identify the threshold values for the sensed parameters that activate the AECD.

(7) Describe the parameters that the AECD modulates (controls) in response to any sensed parameters, including the range of modulation for each parameter, the relationship between the sensed parameters and the controlled parameters and how the modulation achieves the AECD's stated purpose. Use graphs and tables, as necessary.

(8) Describe each AECD's specific calibration details. This may be in the form of data tables, graphical representations, or some other description.

(9) Describe the hierarchy among the AECDs when multiple AECDs sense or modulate the same parameter. Describe whether the strategies interact in a comparative or additive manner and identify which AECD takes precedence in responding, if applicable.

(10) Explain the extent to which the AECD is included in the applicable test procedures specified in subpart F of this part.

(11) Do the following additional things for AECDs designed to protect engines or equipment:

(i) Identify the engine and/or equipment design limits that make protection necessary and describe any damage that would occur without the AECD.

(ii) Describe how each sensed parameter relates to the protected components' design limits or those operating conditions that cause the need for protection.

(iii) Describe the relationship between the design limits/parameters being protected and the parameters sensed or calculated as surrogates for those design limits/parameters, if applicable.

(iv) Describe how the modulation by the AECD prevents engines and/or equipment from exceeding design limits.

(v) Explain why it is necessary to estimate any parameters instead of measuring them directly and describe how the AECD calculates the estimated value, if applicable.

(vi) Describe how you calibrate the AECD modulation to activate only during conditions related to the stated need to protect components and only as needed to sufficiently protect those components in a way that minimizes the emission impact.

(c) Explain how the engine diagnostic system works, describing especially the engine conditions (with the corresponding diagnostic trouble codes) that cause the malfunction-indicator light to go on. Propose what you consider to be extreme conditions under which the diagnostic system should disregard trouble codes, as described in §1048.110.

(d) Describe the engines you selected for testing and the reasons for selecting them.

(e) Describe the test equipment and procedures that you used, including any special or alternate test procedures you used (see §1048.501).

(f) Describe how you operated the emission-data engine ~~or vehicle prior to~~before testing, including the duty cycle

and the number of engine operating hours used to stabilize emission levels. Explain why you selected the method of service accumulation. Describe any scheduled maintenance you did.

(g) List the specifications of ~~the~~each test fuel to show that it falls within the required ranges we specify in 40 CFR part 1065, subpart ~~C~~H.

(h) Identify the engine family's useful life.

(i) ~~Propose~~Include the maintenance ~~and use~~ instructions ~~for~~you will give to the ultimate ~~buyer~~purchaser of each new nonroad engine (see §1048.125).

(j) ~~Propose~~Include the emission-related installation instructions ~~if~~ you ~~sell engines for~~will provide if someone else ~~to install~~installs your engines in a piece of nonroad equipment (see §1048.130).

(k) Identify each high-cost warranted part and show us how you calculated its replacement cost, including the estimated retail cost of the part, labor rates, and labor hours to diagnose and replace defective parts.

(l) ~~Propose an~~Describe your emission control information label~~.~~

~~(m) Present emission data to show that you meet emission standards.~~

~~(1) Present exhaust emission data for HC, NOx, and CO on a test engine to show your engines meet the duty-cycle emission standards we specify in §1048.101(a) and (b). Show these figures before and after applying deterioration factors for each engine. Starting in the 2007 model year, identify the duty-cycle~~ (see §1048.135).

(m) Identify the emission standards to which you are certifying engines in the engine family.

(n) Identify the engine family's deterioration factors and describe how you developed them (see §1048.245). Present any emission test data you used for this.

(o) State that you operated your emission-data engines as described in the application (including the test procedures, test parameters, and test fuels) to show you meet the requirements of this part.

(p) Present emission data to show that you meet emission standards, as follows:

(1) Present exhaust emission data for HC, NOx, and CO on an emission-data engine to show your engines meet the applicable duty-cycle emission standards we specify in §1048.101. Show emission figures before and after applying adjustment factors for deterioration factors for each engine. Include test data for each type of fuel from 40 CFR part 1065, subpart ~~C~~H, on which you intend for engines in the engine family to operate (for example, gasoline, liquefied petroleum gas, methanol, or natural gas). If we specify more than one grade of any fuel type (for example, a summer grade and winter grade of gasoline), you only need to submit test data for one grade, unless the regulations of this part specify otherwise for your engine. Note that §1048.235 allows you to submit an application in certain cases without new emission data.

(2) If your engine family includes a volatile liquid fuel (and you do not use design-based certification under §1048.245), present evaporative test data to show your vehicles meet the evaporative emission standards we specify in subpart B of this part. Show these figures before and after applying deterioration factors, where applicable.

(~~n~~) q) State that all the engines in the engine family comply with the field-testing emission standards we specify in §1048.104 for all normal operation and use when tested as specified in §1048.515. Describe any relevant testing, engineering analysis, or other information in sufficient detail to support your statement.

(r) For engines with maximum engine power above 560 kW, include information showing how your emission controls will function during normal in-use transient operation. For example, this might include the following:

(1) Emission data from transient testing of engines using measurement systems designed for measuring in-use emissions.

(2) Comparison of the engine design for controlling transient emissions with that from engines for which you

have emission data over the transient duty cycle for certification.

(3) Detailed descriptions of control algorithms and other design parameters for controlling transient emissions.

(s) Report all test results, including those from invalid tests or from any ~~nonstandard tests (such as measurements based on exhaust concentrations in parts per million).~~

~~(o) Identify the engine family's deterioration factors and describe how you developed them. Present any emission test data you used for this.~~

~~(p)~~ other tests, whether or not they were conducted according to the test procedures of subpart F of this part. If you measure CO_2, report those emission levels. We may ask you to send other information to confirm that your tests were valid under the requirements of this part and 40 CFR part 1065.

(t) Describe all adjustable operating parameters (see §1048.115(e)), including ~~the following.~~

~~(1)~~ production tolerances. Include the following in your description of each parameter:

(1) The nominal or recommended setting.

(2) The intended physically adjustable ~~range, including production tolerances if they affect the~~ range.

(3) The limits or stops used to establish adjustable ranges.

(4) Information showing why the limits, stops, or other means of inhibiting adjustment are effective in preventing adjustment of parameters on in-use engines to settings outside your intended physically adjustable ranges.

~~(q) Describe everything we need to read~~

(u) Provide the information to read, record, and interpret all the information broadcast by an engine's onboard computers and electronic control ~~modules and s~~units. State that, upon request, you will give us any hardware, software, or tools we would need to do this. If you broadcast a surrogate parameter for torque values, you must provide us what we need to convert these into torque units. You may reference any appropriate publicly released standards that define conventions for these messages and parameters. Format your information consistent with publicly released standards.

(~~r~~v) Confirm that your emission-related installation instructions specify how to ensure that sampling of exhaust emissions will be possible after engines are installed in equipment and placed in service. If this cannot be done by simply adding a 20-centimeter extension to the exhaust pipe, show how to sample exhaust emissions in a way that prevents diluting the exhaust sample with ambient air.

(w) State whether your engine will operate in variable-speed applications, constant-speed applications, or both. If your certification covers only constant-speed or only variable-speed applications, describe how you will prevent use of these engines in ~~the~~ applications for which they are not certified.

~~(s) Starting in the 2007 model year, state that all the engines in the engine family comply with the field-testing emission standards we specify in §1048.101(c) for all normal operation and use (see §1048.515). Describe in detail any testing, engineering analysis, or other information on which you base this statement.~~

~~(t) State that you operated your test engines according to the specified procedures and test parameters using the fuels described in the application to show you meet the requirements of this part.~~

~~(u) State unconditionally~~

(x) Unconditionally certify that all the engines in the engine family comply with the requirements of this part, other referenced parts of the CFR, and the Clean Air Act.

(~~v~~y) Include estimates of U.S.-directed production volumes.

~~(w) Show us how to modify your production engines to measure emissions in the field (see §1048.115(d)).~~

~~(x) Add other information to help us evaluate your application if we ask for it~~

(z) Include other applicable information, such as information specified in this part or part 1068 of this chapter related to requests for exemptions.

§1048.210 May I get preliminary approval before I complete my application?

If you send us information before you finish the application, we will review it and make any appropriate determinations ~~listed in §1048.215(b)(1) through (7)~~, especially for questions related to engine family definitions, auxiliary emission-control devices, deterioration factors, testing for service accumulation, and maintenance. Decisions made under this section are considered to be preliminary approval~~. We will generally not disapprove applications under §1048.215(b)(1) through (5) where we have given you preliminary approval, unless we find new and substantial information supporting a different decision.~~

~~(a)~~, subject to final review and approval. If you request preliminary approval related to the upcoming model year or the model year after that, we will make ~~a "~~best-efforts~~" attempt~~ to make the appropriate determinations as soon as ~~possible~~practicable. We will generally not provide preliminary approval related to a future model year more than two years ahead of time.

~~(b) You may consider full compliance with published guidance to be preliminary approval only if the guidance includes a statement that we intend you to consider it as such.~~

~~**§1048.215 What happens after I complete my application?**~~

~~(a) If any of the information in your application changes after you submit it, amend it as described in §1048.225.~~

~~(b) We may deny your application (that is, determine that we cannot approve it without revision) if the engine family does not meet the requirements of this part or the Act. For example:~~

- ~~(1) If you inappropriately use the provisions of §1048.230(c) or (d) to define a broader or narrower engine family, we will require you to redefine your engine family.~~
- ~~(2) If we determine you did not appropriately select the useful life under §1048.101(g), we will require you to lengthen it.~~
- ~~(3) If we determine you did not appropriately select deterioration factors under §1048.240(c), we will require you to revise them.~~
- ~~(4) If your diagnostic system is inadequate for detecting significant malfunctions in emission-control systems, as described in §1048.110(b), we will require you to make the system more effective.~~
- ~~(5) If your diagnostic system inappropriately disregards trouble codes under certain conditions, as described in §1048.110(f), we will require you to change the system to operate under broader conditions.~~
- ~~(6) If your proposed emission control information label is inconsistent with §1048.135, we will require you to change it (and tell you how, if possible).~~
- ~~(7) If you require or recommend maintenance and use instructions inconsistent with §1048.125, we will require you to change them.~~
- ~~(8) If we find any other problem with your application, we will tell you what the problem is and what needs to be corrected.~~

~~(c) If we determine your application is complete and shows that the engine family meets all the requirements of this part and the Act, we will issue a certificate of conformity for your engine family for that model year. If we deny the application, we will explain why in writing. You may then ask us to hold a hearing to reconsider our decision (see §1048.820).~~

§1048.220 How do I amend the maintenance instructions in my application?

~~S~~You may amend your emission-related maintenance instructions after you submit your application for certification, as long as the amended instructions remain consistent with the provisions of §1048.125. You must send the Designated Compliance Officer a request to amend your application for certification for an engine family if you want to change the emission-related maintenance instructions in a way that could affect emissions. In your request, describe the proposed changes to the maintenance instructions. We will disapprove your request if we determine that the amended instructions are inconsistent with maintenance you performed on emission-data engines.

(a) If you are decreasing the specified ~~level of~~ maintenance, you may distribute the new maintenance instructions to your customers 30 days after we receive your request, unless we disapprove your request. We may approve a shorter time or waive this requirement.

(b) If your requested change would not decrease the specified ~~level of~~ maintenance, you may distribute the new maintenance instructions anytime after you send your request.

~~(c) If you are correcting or~~ For example, this paragraph (b) would cover adding instructions to increase the frequency of a maintenance step for engines in severe-duty applications.

(c) You need not request approval if you are making only minor corrections (such as correcting typographical mistakes), clarifying your maintenance instructions, or ~~if you are~~ changing instructions for maintenance unrelated to emission ~~controls, the requirements of this section do not apply~~control.

§1048.225 How do I amend my application for certification to include new or modified engines?

Before we issue you a certificate of conformity, you may amend your application to include new or modified engine configurations, subject to the provisions of this section. After we have issued your certificate of conformity, you may send us an amended application requesting that we include new or modified engine configurations within the scope of the certificate, subject to the provisions of this section. You must amend your application if any changes occur with respect to any information included in your application.

(a) You must amend your application ~~for certification~~ before you take either of the following actions:

(1) Add an engine ~~to a certificate of conformity (this includes any changes you make in selecting emission standards under §1048.205(m)(1)).~~

~~(2) Make a design change for a certified engine family~~(that is, an additional engine configuration) to an engine family. In this case, the engine added must be consistent with other engines in the engine family with respect to the criteria listed in §1048.230.

(2) Change an engine already included in an engine family in a way that may affect emissions, or ~~an emission-related part over the engine's lifetime.~~

~~(b) Send the Designated Officer a request to amend the~~change any of the components you described in your application for certification ~~for an engine family. In your request, do all of the following:~~

~~(1) Describe~~. This includes production and design changes that may affect emissions any time during the engine's lifetime.

(b) To amend your application for certification, send the Designated Compliance Officer the following information:

(1) Describe in detail the addition or change in the engine model or configuration you ~~are adding or changing~~intend to make.

(2) Include engineering evaluations or ~~reasons why the original test engine is or is not~~data showing that the amended engine family complies with all applicable requirements. You may do this by showing that the original emission-data engine is still appropriate with respect to showing compliance of the amended family with all

applicable requirements.

(3) If the original ~~test~~emission-data engine for the engine family is not appropriate to show compliance for the new or modified nonroad engine, include new test data showing that the new or modified nonroad engine meets the requirements of this part.

(c) ~~You~~We may ask for more test data or engineering evaluations. You must give us these within 30 days after we request them.

(d) For engine families already covered by a certificate of conformity, we will determine whether the existing certificate of conformity covers your new or modified nonroad engine. You may ask for a hearing if we deny your request (see §1048.820).

(e) For engine families already covered by a certificate of conformity, you may start producing the new or modified nonroad engine anytime after you send us your ~~request. If~~amended application, before we make a decision under paragraph (d) of this section. However, if we determine that the affected engines do not meet applicable requirements, we will ~~require~~notify you to cease production of the engines and may require you to recall ~~and correct~~ the engines at no expense to the owner. ~~If you choose~~Choosing to produce engines under this paragraph (~~c~~e); ~~we will consider that~~ is deemed to be consent to recall all engines that we determine do not meet applicable emission standards or other requirements and to remedy the nonconformity at no expense to the owner.

~~(d) You must give us test data within 30 days if we ask for more testing, or~~ If you do not provide information required under paragraph (c) of this section within 30 days, you must stop producing the ~~engine if you cannot do this. You may give us an engineering evaluation instead of test data if we agree that you can address our questions without test data.~~

~~(e) If we determine that the certificate of conformity would not cover your~~ new or modified nonroad ~~engine, we will send you a written explanation of our decision. In this case, you may no longer produce these engines, though you may ask for a hearing for us to reconsider our decision (see §1048.820)~~engines.

§1048.230 How do I select engine families?

(a) Divide your product line into families of engines that ~~you~~are expected to have similar emission characteristics throughout the useful life. Your engine family is limited to a single model year.

(b) Group engines in the same engine family if they are the same in all of the following aspects:

(1) The combustion cycle.

(2) The cooling system (water-cooled vs. air-cooled).

(3) Configuration of the fuel system (for example, fuel injection vs. carburetion).

(4) Method of air aspiration.

(5) The number, location, volume, and composition of catalytic converters.

(6) The number, arrangement, and approximate bore diameter of cylinders.

(7) Evaporative emission controls.

(c) ~~In some cases y~~You may subdivide a group of engines that is identical under paragraph (b) of this section into different engine families~~. To do so,~~ if you ~~must~~ show ~~you~~the expected emission characteristics ~~to be~~are different during the useful life ~~or that any of the following engine characteristics are different:~~

~~(1) Method of actuating intake and exhaust timing (poppet valve, reed valve, rotary valve, etc.).~~

~~(2) Location or size of intake and exhaust valves or ports.~~

~~(3) Configuration of the combustion chamber.~~

~~(4) Cylinder stroke.~~

~~(5) Exhaust system.~~

~~(6) Type of fuel.~~

~~(d) If your engines~~,

(d) You may group engines that are not identical with respect to the things listed in paragraph (b) of this section~~, but~~ in the same engine family if you show that their emission characteristics during the useful life will be similar~~, we may approve grouping them in the same engine family.~~

~~(e) If you cannot appropriately define engine families by the method in this section, we will define them based on features related to emission characteristics~~.

(~~f~~e) You may~~ ask us to~~ create separate families for exhaust emissions and evaporative emissions. If we do this, list both families on the emission control information label.

(~~g~~f) Where necessary, you may divide an engine family into sub-families to meet different emission standards, as specified in §1048.101(a)(2). For issues related to compliance and prohibited actions, we will generally apply decisions to the whole engine family. For engine labels and other administrative provisions, we may approve your request for separate treatment of sub-families.

§1048.235 What emission testing must I perform for my application for a certificate of conformity?

This section describes the emission testing you must perform to show compliance with the emission standards in §§1048.101(a) and (b) and 1048.105 during certification. See §1048.205(~~s~~q) regarding emission testing related to the field-testing standards. See §1048.240 and 40 CFR part 1065, subpart E, regarding service accumulation before emission ~~standards~~testing.

(a) Test your emission-data engines using the procedures and equipment specified in subpart F of this part. For any testing related to evaporative emissions, use good engineering judgment to include a complete fuel system with the engine.

(b) Select ~~engine families~~emission-data engines according to the following criteria:

(1) ~~For exhaust~~Exhaust testing~~, select~~. For each fuel type from each engine family, select a ~~test~~n emission-data engine ~~for each fuel type~~ with a configuration that is most likely to exceed the exhaust emission standards, using good engineering judgment. Consider the emission levels of all exhaust constituents over the full useful life of the engine when operated in a piece of equipment.

(2) ~~For evaporative~~Evaporative testing~~, select from~~. For each engine family that includes a volatile liquid fuel, select a test fuel system ~~for each fuel type~~ with a configuration that is most likely to exceed the evaporative emission standards, using good engineering judgment.

~~(c) You may use previously generated emission data in either of the following cases:~~

~~(1) You may submit emission data for equivalent engine families from previous years instead of doing new tests, but only if the data show that the test engine would meet all the requirements for the latest engine models. We may require you to do new emission testing if we believe the latest engine models could be substantially different from the previously tested engine.~~

~~(2) You may submit emission data for equivalent engine families performed to show compliance with other standards (such as California standards) instead of doing new tests, but only if the data show that the test engine would meet all of this part's requirements.~~

(~~d~~c)~~ We may choose to~~ measure emissions from any of your test engines ~~(~~or other engines from the engine family~~)~~., as follows:

(1)~~ If we do this, you must provide the test engine at the location we select.~~ We may decide to do the testing at

your plant or any other facility. If we ~~choose to~~do this, you must deliver the test engine to a test facility we designate. The test engine you provide must include appropriate manifolds, aftertreatment devices, electronic control units, and other emission-related components not normally attached directly to the engine block. If we do the testing at your plant, you must schedule it as soon as possible and make available the instruments, personnel, and equipment we need.

(2) If we measure emissions on one of your test engines, the results of that testing become the official ~~data~~emission results for the engine. Unless we later invalidate ~~this~~these data, we may decide not to consider your data in determining if your engine family meets ~~the emission standards~~applicable requirements.

(3) Before we test one of your engines, we may set its adjustable parameters to any point within the physically adjustable ranges (see §1048.115(e)).

(4) ~~C~~Before we test one of your engines, we may calibrate ~~the test engine~~it within normal production tolerances for anything we do not consider an adjustable parameter ~~(see §1048.205(p))~~.

(d) You may ask to use emission data from a previous model year instead of doing new tests, but only if all the following are true:

(1) The engine family from the previous model year differs from the current engine family only with respect to model year.

(2) The emission-data engine from the previous model year remains the appropriate emission-data engine under paragraph (b) of this section.

(3) The data show that the emission-data engine would meet all the requirements that apply to the engine family covered by the application for certification.

(e) We may require you to test a second engine of the same or different configuration in addition to the engine tested under paragraph (b) of this section.

(f) If you use an alternate test procedure under 40 CFR 1065.10 and later testing shows that such testing does not produce results that are equivalent to the procedures specified in subpart F of this part, we may reject data you generated using the alternate procedure.

§1048.240 How do I demonstrate that my engine family complies with exhaust emission standards?

(a) For purposes of certification, your engine family is considered in compliance with the applicable numerical emission standards in §1048.101 (a) and (b), if all emission-data engines representing that family have test results showing deteriorated emission levels at or below these standards.

(b) Your engine family ~~does~~is deemed not to comply if any emission-data engine representing that family has test results showing a deteriorated emission level~~s~~ above ~~the~~an applicable emission standard~~s~~ from §1048.101 ~~(a) and (b)~~ for any pollutant.

(c) To compare emission levels from the ~~test~~emission-data engine with the applicable emission standards, apply deterioration factors to the measured emission levels. ~~The deterioration factor is a number that shows the relationship between exhaust emissions at the end of useful life and at the low-hour test point~~ for each pollutant. Specify the deterioration factors based on emission measurements using four significant figures, consistent with good engineering judgment. For example, your deterioration factors must ~~be consistent with emission increases observed~~take into account any available data from in-use testing with similar engines (see subpart E of this part). Small-volume engine manufacturers may use assigned deterioration factors that we establish. Apply ~~the~~ deterioration factors as follows:

(1) Multiplicative deterioration factor. For engines that use aftertreatment technology, such as catalytic

converters, thcuse a multiplicative deterioration factor for exhaust emissions. A multiplicative deterioration factor is the ratio of exhaust emissions at the end of useful life to exhaust emissions at the low-hour test point. Adjust the official emission results for each tested engine at the selected test point by multiplying the measured emissions by the deterioration factor. If the factor is less than one, use one.

(2) Additive deterioration factor. For engines that do not use aftertreatment technology, thcuse an additive deterioration factor for exhaust emissions. An additive deterioration factor is the difference between exhaust emissions at the end of useful life and exhaust emissions at the low-hour test point. Adjust the official emission results for each tested engine at the selected test point by adding the factor to the measured emissions. If the factor is less than zero, use zero.

(d) After adjusting the emission levels for deterioration, round themCollect emission data using measurements to one more decimal place than the applicable standard. Apply the deterioration factor to the official emission result, as described in paragraph (c) of this section, then round the adjusted figure to the same number of decimal places as the emission standard. Compare the rounded emission levels to the emission standard for each test engineemission-data engine. In the case of HC+NOx standards, apply the deterioration factor to each pollutant and then add the results before rounding.

§1048.245 How do I demonstrate that my engine family complies with evaporative emission standards?

(a) For certification, your engine family is considered in compliance with the evaporative emission standards in subpart B of this part if you do either of the following:

(1) You have test results showing that evaporative emissions in the family are at or below the standards throughout the useful life.

(2) Where applicable, you comply with the design specifications in paragraph (e) of this section.

(b) Your engine family does not comply if any fuel system representing that family has test results showing emission levels above the standards.

(c) Use good engineering judgment to develop a test plan to establish deterioration factors to show how much emissions increase at the end of useful life.

(d) If you adjust the emission levels for deterioration, round them to the same number of decimal places as the emission standard. Compare the rounded emission levels to the emission standard for each test fuel system.

(e) You may demonstrate that your engine family complies with the evaporative emission standards by demonstrating that you use the following control technologies:

(1) For certification to the standards specified in §1048.105(a)(1), with the following technologies:

(i) Use a tethered or self-closing gas cap on a fuel tank that stays sealed up to a positive pressure of 24.5 kPa (3.5 psig) or a vacuum pressure of 10.5 kPa (1.5 psig).

(ii) [Reserved]

(2) For certification to the standards specified in §1048.105(a)(3), demonstrating that you use design features to prevent fuel boiling under all normal operation. You may do this using fuel temperature data measured during normal operation.

(3) We may establish additional options for design-based certification where we find that new test data demonstrate that a technology will ensure compliance with the emission standards in this section

§1048.250 What records must I keep and make available to EPA?

(a) Organize and maintain the following records ~~to keep them readily available; we may review these records at any time~~:

(1) A copy of all applications and any summary information you sent~~d~~ us.

(2) Any of the information we specify in §1048.205 that you ~~did~~were not required to include in your application.

(3) A detailed history of each emission-data engine. ~~In~~For each ~~history~~engine, describe all of the following:

(i) The ~~test~~emission-data engine's construction, including its origin and buildup, steps you took to ensure that it represents production engines, any components you built specially for it, and all ~~emission-related~~the components you include in your application for certification.

(ii) How you accumulated engine operating hours (service accumulation), including the dates and the number of hours accumulated.

(iii) All maintenance ~~(~~, including modifications, parts changes, and other service~~)~~, and the dates and reasons for the maintenance.

(iv) All your emission tests, including documentation on routine and standard tests, as specified in part 40 CFR part 1065, and the date and purpose of each test.

(v) All tests to diagnose engine or emission-control performance, giving the date and time of each and the reasons for the test.

(vi) Any other significant events.

(4) Production figures for each engine family divided by assembly plant.

(5) Keep a list of engine identification numbers for all the engines you produce under each certificate of conformity.

(b) Keep data from routine emission tests (such as test cell temperatures and relative humidity readings) for one year after we issue the associated certificate of conformity. Keep all other information specified in paragraph (a) of this section for eight years after we issue your certificate.

(c) Store these records in any format and on any media, as long as you can promptly send us organized, written records in English if we ask for them. You must keep these records readily available. We may review them at any time.

(d) Send us copies of any engine maintenance instructions or explanations if we ask for them.

§1048.255 When may EPA deny, revoke, or void my certificate of conformity?

(a) If we determine your application is complete and shows that the engine family meets all the requirements of this part and the Act, we will issue a certificate of conformity for your engine family for that model year. We may make the approval subject to additional conditions.

(b) We may deny your application for certification if we determine that your engine family fails to comply with emission standards or other requirements of this part or the Act. Our decision may be based on ~~any~~a review of all information available to us ~~showing you do not meet emission standards or other requirements, including any testing that we conduct under paragraph (f) of this section~~. If we deny your application, we will explain why in writing.

(~~b~~c) In addition, we may deny your application or suspend or revoke your certificate if you do any of the following:

(1) Refuse to comply with any testing or reporting requirements.

(2) Submit false or incomplete information (paragraph (~~d~~e) of this section applies if this is fraudulent).

(3) Render inaccurate any test data.

(4) Deny us from completing authorized activities despite our presenting a warrant or court order (see 40 CFR 1068.20). This includes a failure to provide reasonable assistance.

(5) Produce engines for importation into the United States at a location where local law prohibits us from carrying out authorized activities.

(6) Fail to supply requested information or amend your application to include all engines being produced.

(7) Take any action that otherwise circumvents the intent of the Act or this part.

(~~c~~d) We may void your certificate if you do not keep the records we require or do not give us information when we ask for it.

(~~d~~e) We may void your certificate if we find that you intentionally submitted false or incomplete information.

(~~e~~f) If we deny your application or suspend, revoke, or void your certificate, you may ask for a hearing (see §1048.820). ~~Any such hearing will be limited to substantial and factual issues.~~

~~(f) We may conduct confirmatory testing of your engines as part of certification. We may deny your application for certification or revoke your certificate if your engines fail to comply with emission standards or other requirements during confirmatory testing.~~

Subpart D—Testing Production-line Engines

§1048.301 When must I test my production-line engines?

(a) If you produce engines that are subject to the requirements of this part, you must test them as described in this subpart.

(b) We may suspend or revoke your certificate of conformity for certain engine families if your production-line engines do not meet the requirements of this part or you do not fulfill your obligations under this subpart (see §§1048.325 and 1048.340).

(c) Other requirements apply to engines that you produce. Other regulatory provisions authorize us to suspend, revoke, or void your certificate of conformity, or order recalls for engines families without regard to whether they have passed these production-line testing requirements. The requirements of this part do not affect our ability to do selective enforcement audits, as described in part 1068 of this chapter. Individual engines in families that pass these production-line testing requirements must also conform to all applicable regulations of this part and part 1068 of this chapter.

(d) You may ask to use an alternate program for testing production-line engines. In your request, you must show us that the alternate program gives equal assurance that your production-line engines meet the requirements of this part. If we approve your alternate program, we may waive some or all of this subpart's requirements.

(e) If you certify an engine family with carryover emission data, as described in §1048.235(c), and these equivalent engine families consistently pass the production-line testing requirements over the preceding two-year period, you may ask for a reduced testing rate for further production-line testing for that family. The minimum testing rate is one engine per engine family. If we reduce your testing rate, we may limit our approval to any number of model years. In determining whether to approve your request, we may consider the number of engines that have failed the emission tests.

(f) We may ask you to make a reasonable number of production-line engines available for a reasonable time so we can test or inspect them for compliance with the requirements of this part. See 40 CFR 1068.27.

§1048.305 How must I prepare and test my production-line engines?

(a) Test procedures. Test your production-line engines using either the steady-state or transient testing procedures in subpart F of this part to show you meet the emission standards in §1048.101(a) or (b), respectively. We may require you to test engines using the transient testing procedures to show you meet the emission standards in §1048.101(a).

(b) Modifying a test engine. Once an engine is selected for testing (see §1048.310), you may adjust, repair, prepare, or modify it or check its emissions only if one of the following is true:

(1) You document the need for doing so in your procedures for assembling and inspecting all your production engines and make the action routine for all the engines in the engine family.

(2) This subpart otherwise specifically allows your action.

(3) We approve your action in advance.

(c) Engine malfunction. If an engine malfunction prevents further emission testing, ask us to approve your decision to either repair the engine or delete it from the test sequence.

(d) Setting adjustable parameters. Before any test, we may adjust or require you to adjust any adjustable parameter to any setting within its physically adjustable range.

(1) We may adjust or require you to adjust idle speed outside the physically adjustable range as needed only until the engine has stabilized emission levels (see paragraph (e) of this section). We may ask you for information needed to establish an alternate minimum idle speed.

(2) We may make or specify adjustments within the physically adjustable range by considering their effect on emission levels, as well as how likely it is someone will make such an adjustment with in-use engines.

(e) Stabilizing emission levels. Before you test production-line engines, you may operate the engine to stabilize the emission levels. Using good engineering judgment, operate your engines in a way that represents the way production engines will be used. You may operate each engine for no more than the greater of two periods:

(1) 50 hours.

(2) The number of hours you operated your emission-data engine for certifying the engine family (see 40 CFR part 1065, subpart E).

(f) Damage during shipment. If shipping an engine to a remote facility for production-line testing makes necessary an adjustment or repair, you must wait until after the ~~after the~~ initial emission test to do this work. We may waive this requirement if the test would be impossible or unsafe, or if it would permanently damage the engine. Report to us, in your written report under §1048.345, all adjustments or repairs you make on test engines before each test.

(g) Retesting after invalid tests. You may retest an engine if you determine an emission test is invalid under subpart F of this part. Explain in your written report reasons for invalidating any test and the emission results from all tests. If you retest an engine and, within ten days after testing, ask to substitute results of the new tests for the original ones, we will answer within ten days after we receive your information.

§1048.310 How must I select engines for production-line testing?

(a) Use test results from two engines for each engine family to calculate the required sample size for the model year. Update this calculation with each test.

(b) Early in each calendar quarter, randomly select and test two engines from the end of the assembly line for each engine family.

(c) Calculate the required sample size for each engine family. Separately calculate this figure for HC+NOx and for CO. The required sample size is the greater of these two calculated values. Use the following equation:

$$N = \left[\frac{(t_{95} \times \sigma)}{(x - STD)}\right]^2 + 1$$

Where:

N = Required sample size for the model year.

t_{95} = 95% confidence coefficient, which depends on the number of tests completed, n, as specified in the table in paragraph (c)(1) of this section. It defines 95% confidence intervals for a one-tail distribution.

x = Mean of emission test results of the sample.

STD = Emission standard.

σ = Test sample standard deviation (see paragraph (c)(2) of this section).

n = The number of tests completed in an engine family.

(1) Determine the 95% confidence coefficient, t_{95}, from the following table:

n	t_{95}	n	t_{95}	n	t_{95}
2	6.31	12	1.80	22	1.72
3	2.92	13	1.78	23	1.72
4	2.35	14	1.77	24	1.71
5	2.13	15	1.76	25	1.71
6	2.02	16	1.75	26	1.71
7	1.94	17	1.75	27	1.71
8	1.90	18	1.74	28	1.70
9	1.86	19	1.73	29	1.70
10	1.83	20	1.73	30+	1.70
11	1.81	21	1.72		

(2) Calculate the standard deviation, σ, for the test sample using the following formula:

$$\sigma = \sqrt{\frac{\Sigma(X_i - x)^2}{n - 1}}$$

Where:

X_i = Emission test result for an individual engine.

~~n = The number of tests completed in an engine family.~~

(d) Use final deteriorated test results to calculate the variables in the equations in paragraph (c) of this section (see §1048.315(a)).

(e) After each new test, recalculate the required sample size using the updated mean values, standard deviations, and the appropriate 95-percent confidence coefficient.

(f) Distribute the remaining engine tests evenly throughout the rest of the year. You may need to adjust your schedule for selecting engines if the required sample size changes. Continue to randomly select engines from each engine family; this may involve testing engines that operate on different fuels.

(g) Continue testing any engine family for which the sample mean, x, is greater than the emission standard. This applies if the sample mean for either HC+NOx or for CO is greater than the emission standard. Continue testing until one of the following things happens:

(1) The ~~sample size, n, for~~number of tests completed in an engine family, n, is greater than the required sample size, N, and the sample mean, x, is less than or equal to the emission standard. For example, if N = 3.1 after the third test, the sample-size calculation does not allow you to stop testing.

(2) The engine family does not comply according to §1048.3~~2~~15.

(3) You test 30 engines from the engine family.

(4) You test eight engines and one percent of your projected annual U.S.-directed production volume for the engine family.

(5) You choose to declare that the engine family does not comply with the requirements of this subpart.

(h) If the sample-size calculation allows you to stop testing for a pollutant, you must continue measuring emission levels of that pollutant for any additional tests required under this section. However, you need not continue making the calculations specified in this section for that pollutant. This paragraph (h) does not affect the requirements in section §1048.320.

(i) You may elect to test more randomly chosen engines than we require under this section. Include these engines in the sample-size calculations.

§1048.315 How do I know when my engine family fails the production-line testing requirements?

This section describes the pass/fail criteria for the production-line testing requirements. We apply this criteria on an engine-family basis. See §1048.320 for the requirements that apply to individual engines that fail a production-line test.

(a) Calculate your test results. Round them to the number of decimal places in the emission standard expressed to one more decimal place.

(1) Initial and final test results. Calculate and round the test results for each engine. If you do several tests on an engine, calculate the initial test results, then add them together and divide by the number of tests and round for the final test results on that engine.

(2) Final deteriorated test results. Apply the deterioration factor for the engine family to the final test results (see §1048.240(c)).

(b) Construct the following CumSum Equation for each engine family (for HC+NOx and for CO emissions):

$$C_i = C_{i-1} + X_i - (STD + 0.25 \times \sigma)$$

Where:

C_i = The current CumSum statistic.

C_{i-1} = The previous CumSum statistic. For the first test, CumSum statistic is 0 (i.e. $C_1 = 0$).

X_i = The current emission test result for an individual engine.

STD = Emission standard.

(c) Use final deteriorated test results to calculate the variables in the equation in paragraph (b) of this section (see §1048.315(a)).

(d) After each new test, recalculate the CumSum statistic.

(e) If you test more than the required number of engines, include the results from these additional tests in the CumSum Equation.

(f) After each test, compare the current CumSum statistic, C_i, to the recalculated Action Limit, H, defined as $H = 5.0 \times \sigma$.

(g) If the CumSum statistic exceeds the Action Limit in two consecutive tests, the engine family fails the production-line testing requirements of this subpart. Tell us within ten working days if this happens.

(h) If you amend the application for certification for an engine family (see §1048.225), do not change any previous calculations of sample size or CumSum statistics for the model year.

§1048.320 What happens if one of my production-line engines fails to meet emission standards?

If you have a production-line engine with final deteriorated test results exceeding one or more emission standards (see §1048.315(a)), the certificate of conformity is automatically suspended for that failing engine. You must take the following actions before your certificate of conformity can cover that engine:

(a) Correct the problem and retest the engine to show it complies with all emission standards.

(b) Include in your written report a description of the test results and the remedy for each engine (see §1048.345).

§1048.325 What happens if an engine family fails the production-line requirements?

(a) We may suspend your certificate of conformity for an engine family if it fails under §1048.315. The suspension may apply to all facilities producing engines from an engine family, even if you find noncompliant engines only at one facility.

(b) We will tell you in writing if we suspend your certificate in whole or in part. We will not suspend a certificate until at least 15 days after the engine family fails. The suspension is effective when you receive our notice.

(c) Up to 15 days after we suspend the certificate for an engine family, you may ask for a hearing (see §1048.820). If we agree before a hearing that we used erroneous information in deciding to suspend the certificate, we will reinstate the certificate.

(d) Section ~~§1048~~1048.335 specifies steps you must take to remedy the cause of the engine family's production-line failure. All the engines you have produced since the end of the last test period are presumed noncompliant and should be addressed in your proposed remedy. We may require you to apply the remedy to engines produced earlier if we determine that the cause of the failure is likely to have affected the earlier engines.

§1048.330 May I sell engines from an engine family with a suspended certificate of conformity?

You may sell engines that you produce after we suspend the engine family's certificate of conformity under §1048.315 only if one of the following occurs:

(a) You test each engine you produce and show it complies with emission standards that apply.

(b) We conditionally reinstate the certificate for the engine family. We may do so if you agree to recall all the affected engines and remedy any noncompliance at no expense to the owner if later testing shows that the engine family still does not comply.

§1048.335 How do I ask EPA to reinstate my suspended certificate?

(a) Send us a written report asking us to reinstate your suspended certificate. In your report, identify the reason for noncompliance, propose a remedy for the engine family, and commit to a date for carrying it out. In your proposed remedy include any quality control measures you propose to keep the problem from happening again.

(b) Give us data from production-line testing that shows the remedied engine family complies with all the emission standards that apply.

§1048.340 When may EPA revoke my certificate under this subpart and how may I sell these engines again?

(a) We may revoke your certificate for an engine family in the following cases:

(1) You do not meet the reporting requirements.

(2) Your engine family fails to comply with the requirements of this subpart and your proposed remedy to address a suspended certificate under §1048.325 is inadequate to solve the problem or requires you to change the engine's design or emission-control system.

(b) To sell engines from an engine family with a revoked certificate of conformity, you must modify the engine family and then show it complies with the requirements of this part.

(1) If we determine your proposed design change may not control emissions for the engine's full useful life, we will tell you within five working days after receiving your report. In this case we will decide whether production-line testing will be enough for us to evaluate the change or whether you need to do more testing.

(2) Unless we require more testing, you may show compliance by testing production-line engines as described in this subpart.

(3) We will issue a new or updated certificate of conformity when you have met these requirements.

§1048.345 What production-line testing records must I send to EPA?

Do all the following things unless we ask you to send us less information:

(a) Within 30 calendar days of the end of each calendar quarter, send us a report with the following information:

(1) Describe any facility used to test production-line engines and state its location.

(2) State the total U.S.-directed production volume and number of tests for each engine family.

(3) Describe how you randomly selected engines.

(4) Describe your test engines, including the engine family's identification and the engine's model year, build date, model number, identification number, and number of hours of operation before testing for each test engine.

(5) Identify where you accumulated hours of operation on the engines and describe the procedure and schedule you used.

(6) Provide the test number; the date, time and duration of testing; test procedure; initial test results before and after rounding; final test results; and final deteriorated test results for all tests. Provide the emission results for all measured pollutants. Include information for both valid and invalid tests and the reason for any invalidation.

(7) Describe completely and justify any nonroutine adjustment, modification, repair, preparation, maintenance, or test for the test engine if you did not report it separately under this subpart. Include the results of any emission measurements, regardless of the procedure or type of equipment.

(8) Provide the CumSum analysis required in §1048.315 for each engine family.

(9) Report on each failed engine as described in §1048.320.

(10) State the date the calendar quarter ended for each engine family.

(b) We may ask you to add information to your written report, so we can determine whether your new nonroad engines conform with the requirements of this subpart.

(c) An authorized representative of your company must sign the following statement:

> We submit this report under Sections 208 and 213 of the Clean Air Act. Our production-line testing conformed completely with the requirements of 40 CFR part 1048. We have not changed production processes or quality-control procedures for the engine family in a way that might affect the emission control from production engines. All the information in this report is true and accurate, to the best of my knowledge. I know of the penalties for violating the Clean Air Act and the regulations. (Authorized Company Representative)

(d) Send electronic reports of production-line testing to the Designated Officer using an approved information format. If you want to use a different format, send us a written request with justification for a waiver.

(e) We will send copies of your reports to anyone from the public who asks for them. See §1048.815 for information on how we treat information you consider confidential.

§1048.350 What records must I keep?

(a) Organize and maintain your records as described in this section. We may review your records at any time~~, so it is important to keep required information readily available~~.

(b) Keep paper records of your production-line testing for one full year after you complete all the testing required for an engine family in a model year. You may use any additional storage formats or media if you like.

(c) Keep a copy of the written reports described in §1048.345.

(d) Keep the following additional records:

(1) A description of all test equipment for each test cell that you can use to test production-line engines.

(2) The names of supervisors involved in each test.

(3) The name of anyone who authorizes adjusting, repairing, preparing, or modifying a test engine and the names of all supervisors who oversee this work.

(4) If you shipped the engine for testing, the date you shipped it, the associated storage or port facility, and the date the engine arrived at the testing facility.

(5) Any records related to your production-line tests that are not in the written report.

(6) A brief description of any significant events during testing not otherwise described in the written report or in this section.

(7) Any information specified in §1048.345 that you do not include in your written reports.

(e) If we ask, you must give us projected or actual production figures for an engine family. We may ask you to divide your production figures by maximum brake power, displacement, fuel type, or assembly plant (if you produce engines at more than one plant).

(f) Keep a list of engine identification numbers for all the engines you produce under each certificate of conformity. Give us this list within 30 days if we ask for it.

(g) We may ask you to keep or send other information necessary to implement this subpart.

Subpart E—Testing In-use Engines

§1048.401 What testing requirements apply to my engines that have gone into service?

(a) If you produce engines that are subject to the requirements of this part, you must test them as described in this subpart. This generally involves testing engines in the field or removing them for measurement in a laboratory.

(b) We may approve an alternate plan for showing that in-use engines comply with the requirements of this part if one of the following is true:

(1) You produce 200 or fewer engines per year in the selected engine family.

(2) Removing the engine from most of the applications for that engine family causes significant, irreparable damage to the equipment.

(3) You identify a unique aspect of your engine applications that keeps you from doing the required in-use testing.

(c) We may void your certificate of conformity for an engine family if you do not meet your obligations under this part.

(d) Independent of your responsibility to test in-use engines, we may choose at any time to do our own testing of your in-use engines.

(e) If in-use testing shows that engines fail to meet emission standards or other requirements of this part, we may pursue a recall or other remedy as allowed by the Act (see §1048.415).

§1048.405 How does this program work?

(a) You must test in-use engines, for exhaust emissions, from the families we select. We may select up to 25 percent of your engine families in any model year—or one engine family if you have three or fewer families. We will select engine families for testing before the end of the model year. When we select an engine family for testing, we may specify that you preferentially test engines based on fuel type or equipment type. In addition, we may identify specific modes of operation or sampling times. You may choose to test additional engine families that we do not select.

(b) Send us an in-use testing plan within 12 calendar months after we direct you to test a particular engine family. Complete the testing within 24 calendar months after we approve your plan.

(c) You may need to test engines from more than one model year at a given time.

§1048.410 How must I select, prepare, and test my in-use engines?

(a) You may make arrangements to select representative test engines from your own fleet or from other independent sources.

(b) For the selected engine families, select engines that you or your customers have–

(1) Operated for at least 50 percent of the engine family's useful life (see §1048.101(d));

(2) Not maintained or used in an abnormal way; and

(3) Documented in terms of total hours of operation, maintenance, operating conditions, and storage.

(c) Use the following methods to determine the number of engines you must test in each engine family:

(1) Test at least two engines if you produce 2,000 or fewer engines in the model year from all engine families, or if you produce 500 or fewer engines from the selected engine family. Otherwise, test at least four engines.

(2) If you successfully complete an in-use test program on an engine family and later certify an equivalent engine family with carryover emission data, as described in §1048.235(c), then test at least one engine instead of the testing rates in paragraph (c)(1) of this section.

(3) If you test the minimum required number of engines and all comply fully with emission standards, you may

stop testing.

(4) For each engine that fails any applicable standard, test two more. Regardless of measured emission levels, you do not have to test more than ten engines in an engine family. You may do more tests than we require.

(5) You may concede that the engine family does not comply before testing a total of ten engines.

(d) You may do minimal maintenance to set components of a test engine to specifications for anything we do not consider an adjustable parameter (see §1048.205(p)). Limit maintenance to what is in the owner's instructions for engines with that amount of service and age. Document all maintenance and adjustments.

(e) Do at least one valid exhaust emission test for each test engine.

(f) For a test program on an engine family, choose one of the following methods to test your engines:

(1) Remove the selected engines for testing in a laboratory. Use the applicable steady-state and transient procedures in subpart F of this part to show compliance with the duty-cycle standards in §1048.101(a) and (b). We may direct you to measure emissions on the dynamometer using the supplemental test procedures in §1048.515 to show compliance with the field-testing standards in §1048.101(c).

(2) Test the selected engines while they remain installed in the equipment. Use the field testing procedures in subpart F of this part. Measure emissions during normal operation of the equipment to show compliance with the field-testing standards in §1048.101(c). We may direct you to include specific areas of normal operation.

(g) You may ask us to waive parts of the prescribed test procedures if they are not necessary to determine in-use compliance.

(h) Calculate the average emission levels for an engine family from the results for the set of tested engines. Round them to the number of decimal places in the emission standards expressed to one more decimal place.

§1048.415 What happens if in-use engines do not meet requirements?

(a) Determine the reason each in-use engine exceeds the emission standards.

(b) If the average emission levels calculated in §1048.410(h) exceed any of the emission standards that apply, notify us within fifteen days of completing testing on this family. Otherwise follow the reporting instructions in §1048.420.

(c) We will consider failure rates, average emission levels, and any defects— among other things— to decide on taking remedial action under this subpart (see 40 CFR 1068.505). We may consider the results from any voluntary additional testing you conduct. We may also consider information related to testing from other engine families showing that you designed them to exceed the minimum requirements for controlling emissions. We may order a recall before or after you complete testing of an engine family if we determine a substantial number of engines do not conform to section 213 of the Act or to this part.

(d) If in-use testing reveals a design or manufacturing defect that prevents engines from meeting the requirements of this part, you must correct the defect as soon as possible for any future production for engines in every family affected by the defect.

(e) You may voluntarily recall an engine family for emission failures, as described in 40 CFR 1068.535, unless we have ordered a recall for that family under 40 CFR 1068.505.

(f) You have the right to a hearing before we order you to recall your engines or implement an alternative remedy (see §1048.820).

§1048.420 What in-use testing information must I report to EPA?

(a) In a report to us within three months after you finish testing an engine family, do all the following:

(1) Identify the engine family, model, serial number, and date of manufacture.

(2) For each engine inspected or considered for testing, identify whether the diagnostic system was functioning.

(3) Describe the specific reasons for disqualifying any engines for not being properly maintained or used.

(4) For each engine selected for testing, include the following information:

(i) Estimate the hours each engine was used before testing.

(ii) Describe all maintenance, adjustments, modifications, and repairs to each test engine.

(5) State the date and time of each test attempt.

(6) Include the results of all emission testing, including incomplete or invalidated tests, if any.

(b) Send electronic reports of in-use testing to the Designated Officer using an approved information format. If you want to use a different format, send us a written request with justification for a waiver.

(c) We will send copies of your reports to anyone from the public who asks for them. See §1048.815 for information on how we treat information you consider confidential.

(d) We may ask for more information.

§1048.425 What records must I keep?

(a) Organize and maintain your records as described in this section. We may review your records at any time~~, so it is important to keep required information readily available~~.

(b) Keep paper records of your in-use testing for one full year after you complete all the testing required for an engine family in a model year. You may use any additional storage formats or media if you like.

(c) Keep a copy of the written reports described in §1048.420.

(d) Keep any additional records related to the procurement process.

Subpart F—Test Procedures

§1048.501 ~~What procedures must~~How do I ~~use to~~run a valid emission test ~~my engines~~?

(a) Use the equipment and procedures for spark-ignition engines in 40 CFR part 1065 to ~~show your~~determine whether engines meet the duty-cycle emission standards in §1048.101(a) and (b). Measure ~~HC, NOx, CO, and CO_2 emissions using the full-flow~~the emissions of all the pollutants we regulate in §1048.101 using the full-flow or partial-flow dilute sampling procedures as specified in 40 CFR part 1065. Use the applicable duty cycles specified in §§1048.505 and 1048.510.

(b) ~~We describe in §1048.515~~Section 1048.515 describes the supplemental procedures for ~~showing that your~~evaluating whether engines meet the field-testing emission standards in §1048.101(c).

(c) Use the fuels specified in 40 CFR part 1065, subpart C, to perform valid tests for all the testing we require in this part, except as noted in §1048.515. ~~U~~For service accumulation, use th~~s~~e test fuel~~s~~ or any commercially available fuel ~~for service accumulation~~that is representative of the fuel that in-use engines will use.

(d) To test engines for evaporative emissions, use the equipment and procedures specified for testing diurnal emissions in 40 CFR 86.107-96 and 86.133-96 with fuel meeting the specifications in 40 CFR part 1065, subpart C. Measure emissions from a test engine with a complete fuel system. Reported emission levels must be based on the highest emissions from three successive 24-hour periods of cycling temperatures. Note that you may ~~not be required to test~~omit testing for evaporative emissions during certification if you certify by design, as specified in §1048.245.

(e) ~~-~~You may use special or alternate procedures~~, as described in~~ to the extent we allow them under 40 CFR 1065.10.

(f) ~~We may reject data you generate using alternate procedures if later testing with the procedures in 40 CFR part~~

~~1065 shows contradictory emission data.~~

~~§1048.505 What~~ This subpart is addressed to you as a manufacturer, but it applies equally to anyone who does testing for you, and to us when we perform testing to determine if your engines meet emission standards.

§1048.505 How do I test engines using steady-state duty cycles~~ apply for laboratory testing?~~

~~(a)~~ , including ramped-modal testing?

This section describes how to test engines under steady-state conditions. In some cases, we allow you to choose the appropriate steady-state duty cycle for an engine. In these cases, you must use the duty cycle you select in your application for certification for all testing you perform for that engine family. If we test your engines to confirm that they meet emission standards, we will use the duty cycles you select for your own testing. We may also perform other testing as allowed by the Clean Air Act.

(a) You may perform steady-state testing with either discrete-mode or ramped-modal cycles, as follows:

(1) For discrete-mode testing, sample emissions separately for each mode, then calculate an average emission level for the whole cycle using the weighting factors specified for each mode. Calculate cycle statistics for the sequence of modes and compare with the specified values in 40 CFR part 1065 to confirm that the test is valid. Operate the engine and sampling system as follows:

(i) Engines with NOx aftertreatment. For engines that depend on aftertreatment to meet the NOx emission standard, operate the engine for 5-6 minutes, then sample emissions for 1-3 minutes in each mode.

(ii) Engines without NOx aftertreatment. For other engines, operate the engine for at least 5 minutes, then sample emissions for at least 1 minute in each mode. Calculate cycle statistics for the sequence of modes and compare with the specified values in 40 CFR part 1065 to confirm that the test is valid.

(2) For ramped-modal testing, start sampling at the beginning of the first mode and continue sampling until the end of the last mode. Calculate emissions and cycle statistics the same as for transient testing.

(b) Measure emissions by testing the engine on a dynamometer with one or more of the following sets of ~~steady-state~~ duty cycles to ~~show that the engine~~determine whether it meets the steady-state emission standards in §1048.101(b):

(1) ~~Use the 7-mode duty cycle described in the following table f~~For engines from an engine family that will be used only in variable-speed applications~~.~~

, use one of the following duty cycles:

(i) The following duty cycle applies for discrete-mode testing:

Table 1 of §1048.~~505~~

~~7-Mode Duty Cycle~~[1]505

C2 Mode Number	Engine ~~Speed~~ Speed[1]	Observed Torque[2]	Minimum Time in mode (minutes)	Weighting Factors
1	Maximum test speed	25	3.0	0.06
2	Intermediate test speed	100	3.0	0.02
3	Intermediate test speed	75	3.0	0.05
4	Intermediate test speed	50	3.0	0.32
5	Intermediate test speed	25	3.0	0.30
6	Intermediate test speed	10	3.0	0.10
7	Idle	0	3.0	0.15

~~[1]This duty cycle is analogous to the C2 cycle specified in ISO 8178-4.~~

~~[2]The~~ [1] Speed terms are defined in 40 CFR part 1065.

[2] The percent torque is relative to the maximum torque at the given engine speed.

~~(2) Use the 5-mode duty cycle described in the following table if you certify an engine family for operation only at a single, rated speed.~~

(ii) The following duty cycle applies for ramped-modal testing:

Table 2 of §1048.~~505~~505

RMC ~~5-Mode Duty Cycle for Constant-Speed Engines[1]~~Mode	Time in Mode (seconds)	Engine Speed[1,2]	~~Mode Number~~Torque (percent)[2,3]
	119	Warm Idle	0
~~Engine~~1a Steady-state			
1b Transition	20	Linear Transition	Linear Transition
2a Steady-state	29	Intermediate Speed	
2b Transition	20	Intermediate Speed	~~Torque[2]~~100 ~~Minimum Time in mode (minutes)~~Linear Transition
3a Steady-state	150	Intermediate Speed	10
3b Transition	20	Intermediate Speed	Linear Transition
4a Steady-state	80	Intermediate Speed	75
4b Transition	20	Intermediate Speed	Linear Transition
5a Steady-state	~~Weighting Factors~~513	Intermediate Speed	25
5b Transition	20	Intermediate Speed	Linear Transition
6a Steady-state	549	Intermediate Speed	50
5b Transition	~~1~~20	Linear Transition	Linear Transition
6a Steady-state	96	Maximum test speed	~~100~~25
6b Transition	20	~~3.~~Linear Transition	Linear Transition
7 Steady-state	124	Warm Idle	0

~~0.052Maximum test speed753.00.253Maximum test speed503.00.304Maximum test speed253.00.305Maximum test speed103.00.10~~

~~[1]This duty cycle is analogous to the D2 cycle specified in ISO 8178-4.~~

~~[2]The~~

~~[1] Speed terms are defined in 40 CFR part 1065.~~

~~[2] Advance from one mode to the next within a 20-second transition phase. During the transition phase, command a linear progression from the torque setting of the current mode to the torque setting of the next mode.~~

[3] ~~The~~ percent torque is relative to ~~the~~ maximum torque at ~~maximum test~~the commanded engine speed.

~~(3) Use both of the duty cycles described in paragraphs (a)(1) and (a)~~(2) ~~of this section if you will not restrict~~ For engines from an engine family ~~to constant-speed or variable-speed applications.~~

~~(4) Use only the duty cycle specified in paragraph (a)(2) of this section for all severe-duty engines.~~

~~(5) Use the 2-mode duty cycle described in the following table for high-load engines instead of the other duty cycles in this paragraph (a).~~

that will be used only at a single, rated speed, use one of the following duty cycles:

(i) The following duty cycle applies for discrete-mode testing:

Table 3 of §1048.505

~~2-Mode Duty Cycle for High-Load Engines[1]~~

D2 Mode Number	Engine Speed	Torque[1]	Minimum Time in mode (minutes)	Weighting Factors
1	Maximum test speed	100	3.0	0.~~50~~05
2	Maximum test speed	75	3.0	0.~~50~~25
	Maximum test speed	50	3.0	0.30
4	Maximum test speed	25	3.0	0.30
5	Maximum test speed	10	3.0	0.10

~~2 The~~ [1]The percent torque is relative to the maximum torque at maximum test speed.

(ii) The following duty cycle applies for ramped-modal testing:

Table 4 of §1048.505

RMC Mode	Time in mode (seconds)	Engine Speed	Torque (percent) [1,2]
1a Steady-state	53	Engine Governed	100
1b Transition	20	Engine Governed	Linear transition
2a Steady-state	101	Engine Governed	10
2b Transition	20	Engine Governed	Linear transition
3a Steady-state	277	Engine Governed	75
3b Transition	20	Engine Governed	Linear transition
4a Steady-state	339	Engine Governed	25
4b Transition	20	Engine Governed	Linear transition
5 Steady-state	350	Engine Governed	50

~~[1] The percent torque is relative to maximum test torque.~~

~~[2] Advance from one mode to the next within a 20-second transition phase. During the transition phase,~~ command a linear progression from the torque setting of the current mode to the torque setting of the next mode.

(3) Use a duty cycle from both paragraphs (b)(1) and (b)(2) of this section if you will not restrict an engine family to constant-speed or variable-speed applications.

(4) Use a duty cycle specified in paragraph (b)(2) of this section for all severe-duty engines.

(5) For high-load engines, use one of the following duty cycles:

(i) The following duty cycle applies for discrete-mode testing:

Table 5 of §1048.505

D1 Mode Number	Engine Speed	Torque[1]	Minimum Time in mode (minutes)	Weighting Factors
1	Maximum test speed	100	3.0	0.50
2	Maximum test speed	75	3.0	0.50

[1]The percent torque is relative to the maximum torque at maximum test speed.

(ii) The following duty cycle applies for discrete-mode testing:

Table 6 of §1048.505

RMC Modes	Time in Mode (seconds)	Engine Speed (percent)	Torque (percent)[1,2]
1a Steady-state	290	Engine Governed	100
1b Transition	20	Engine Governed	Linear Transition
2 Steady-state	290	Engine Governed	75

~~[1] The percent torque is relative to maximum test torque.~~

[2] Advance from one mode to the next within a 20-second transition phase. During the transition phase, command a linear progression from the torque setting of the current mode to the torque setting of the next mode.

(~~b~~c) If we test an engine to confirm that it meets the duty-cycle emission standards, we will use the steady-state duty cycles that apply for that engine family.

(~~c~~d) During idle mode, operate the engine with the following parameters:

(1) Hold the speed within your specifications.

(2) ~~Keep the throttle at~~Set the ~~idle-stop position~~engine to operate at its minimum fueling rate.

(3) Keep engine torque under 5 percent of ~~the peak torque value at~~ maximum test ~~speed~~torque.

(~~d~~e) For ~~the~~ full-load operating modes, operate the engine at wide-open throttle.

(~~e~~f) See 40 CFR part 1065 for detailed specifications of tolerances and calculations.

~~(f) In the normal test sequence described in 40 CFR part 1065, subpart F, steady-state testing generally follows the transient test.~~g) For those cases where ~~we do not require~~ transient testing is not necessary, perform the steady-state test according to this section after an appropriate warm-up period, consistent with ~~good engineering judgment.~~

~~**§1048.510 What transient duty cycles apply for laboratory**~~40 CFR part 1065, subpart F.

§1048.510 Which duty cycles do I use for transient testing?

(a) Starting with the 2007 model year, measure emissions by testing the engine on a dynamometer with one of the following transient duty cycles to ~~show that the engine~~determine whether it meets the transient emission standards in §1048.101(a):

(1) ~~If you certify an engine family f~~For constant-speed ~~operation only~~engines and severe-duty engines, use the transient duty-cycle described in Appendix I of this part.

(2) For all other engines, use the transient ~~duty-cycle~~duty cycle described in Appendix II of this part.

(b) If we test an engine to confirm that it meets the duty-cycle emission standards, we will use the transient duty cycle that applies for that engine family.

(c) Warm up the test engine as follows:

(1) Operate the engine for the first 180 seconds of the appropriate duty cycle, then allow it to idle without load for 30 seconds. At the end of the 30-second idling period, start measuring emissions as the engine operates over the prescribed duty cycle. For severe-duty engines, this engine warm-up procedure may include up to 15 minutes of operation over the appropriate duty cycle.

(2) If the engine was already operating before a test, use good engineering judgment to let the engine cool down enough so measured emissions during the next test will accurately represent those from an engine starting at room temperature. For example, if an engine starting at room temperature warms up enough in three minutes to start closed-loop operation and achieve full catalyst activity, then minimal engine cooling is necessary before starting the next test.

(3) You are not required to measure emissions while the engine is warming up. However, you must design your emission-control system to start working as soon as possible after engine starting. In your application for certification, describe how your engine meets this objective (see §1048.205(b)).

§1048.515 ~~F~~What are the field-testing procedures~~.~~?

(a) This section describes the procedures to determine whether your engines meet the field-testing emission standards in §1048.101(c). ~~-~~These procedures may include any normal engine operation and ambient conditions that the engines may experience in use. Paragraph (b) of this section defines the limits of what we will consider normal engine operation and ambient conditions. Use the test procedures we specify in §1048.501, except for the provisions we specify in this section. Measure emissions with one of the following procedures:

(1) Remove the selected engines for testing in a laboratory. You ~~can~~may use an engine dynamometer to simulate normal operation, as described in this section.

(2) Test the selected engines while they remain installed in the equipment. In 40 CFR part 1065, subpart J, we describe the equipment and sampling methods for testing engines in the field. Use fuel meeting the specifications of 40 CFR part 1065~~.210~~, subpart H, or a fuel typical of what you would expect the engine to use in service.

(b) An engine's emissions may not exceed the levels we specify in §1048.101(c) for any continuous sampling period of at least 120 seconds under the following ranges of operation and operating conditions:

(1) Engine operation during the emission sampling period may include any normal operation, subject to the following restrictions:

(i) Average power must be over 5 percent of maximum brake power.

(ii) Continuous time at idle must not be greater than 120 seconds.

(iii) The sampling period may not begin until the engine has reached stable operating temperatures. For example, this would exclude engine operation after starting until the thermostat starts modulating coolant temperature.

(iv) The sampling period may not include engine starting.

(v) For engines that qualify for the alternate Tier 2 emission standards in §1048.101(d), operation at 90 percent or more of maximum power must be less than 10 percent of the total sampling time. You may request our approval for a different power threshold.

(2) Engine testing may occur under any normal conditions without correcting measured emission levels, subject to the following restrictions:

(i) Barometric pressure must be between 80.0 and 103.3 kPa (600 and 775 mm Hg).

(ii) Ambient air temperature must be between 13° and 35° C.

Subpart G—Compliance Provisions

§1048.601 What compliance provisions apply to these engines?

Engine and equipment manufacturers, as well as owners, operators, and rebuilders of ~~these~~ engines subject to the requirements of this part, and all other persons, must observe the provisions of this part, the requirements and prohibitions in 40 CFR part 1068, and the ~~requirements of the Act. The compliance provisions in this subpart apply only to the engines we regulate in this part.~~

~~**§1048.605 What are the provisions for exempting engines from the requirements of this part if they are already**~~provisions of the Act.

§1048.605 What provisions apply to engines certified under the motor-vehicle program?

(a) ~~This section applies to you i~~General provisions. If you are an engine manufacturer, this section allows you to introduce new nonroad engines into commerce if they are already certified to the requirements that apply to compression-ignition engines under 40 CFR parts 85 and 86 for the appropriate model year. If you comply with all the provisions of this section, we consider the certificate issued under 40 CFR part 86 for each engine to also be a valid certificate of conformity under this part 1048 for its model year, without a separate application for certification under the requirements of this part 1048. See §1048.610 ~~f~~for similar provisions that apply to engines certified to chassis-based standards for motor vehicles.

(b) Equipment-manufacturer provisions. If you are not an engine manufacturer~~.~~

~~(b) The only requirements or prohibitions from this part that apply to an engine that is exempt~~, you may produce nonroad equipment using motor-vehicle engines under this section ~~are~~as long as the engine has been properly labeled as specified in paragraph (d)(5) of this section and you do not make any of the changes described in paragraph (d)(2) of this section. If you modify the motor-vehicle engine in any of the ways described in paragraph (d)(2) of this section, we will consider you a manufacturer of a new nonroad engine. Such engine modifications prevent you from using the provisions of this section.

(c) Liability. Engines for which you meet the requirements of this section are exempt from all the requirements and prohibitions of this part, except for those specified in this section.

~~(c) If you~~ Engines exempted under this section must meet all the applicable requirements from 40 CFR parts 85 and 86. This applies to engine manufacturers, equipment manufacturers who use these engines, and all other persons as if these engines were used in a motor vehicle. The prohibited acts of §1068.101(a)(1) apply to these new engines and equipment; however, we consider the certificate issued under 40 CFR part 86 for each engine to also be a valid certificate of conformity under this part 1048 for its model year. If we make a determination that these engines do not conform to the regulations during their useful life, we may require you to recall them under 40 CFR part 86 or 40 CFR 1068.505.

(d) Specific requirements. If you are an engine manufacturer and meet all the following criteria and requirements regarding your new nonroad engine, ~~it~~the engine is ~~exempt~~ eligible for an exemption under this section:

(1) ~~You~~Your engine must ~~produce it by modifying an engine~~be covered by a valid certificate of conformity issued under 40 CFR part 86.

(2) ~~Do~~You must not make any changes to the certified engine that ~~we~~ could reasonably be expected to increase its exhaust ~~or~~emissions for any pollutant, or its evaporative emissions. For example, if you make any of the following changes to one of these engines, you do not qualify for this exemption:

(i) Change any fuel system or evaporative system parameters from the certified configuration (this does not apply to refueling ~~emission~~ controls).

~~(ii) Change any other emission-related~~

(ii) Change, remove, or fail to properly install any other component, element of design, or calibration specified in the engine manufacturer's application for certification. This includes aftertreatment devices and all related components.

(iii) Modify or design the engine cooling system so that temperatures or heat rejection rates are outside the original engine manufacturer's specified ranges.

(3) ~~Demonstrate~~You must show that fewer than 50 percent of the engine model's total sales for the model year, from all companies, are used in nonroad applications, as follows:

(i) If you are the original manufacturer of the engine, base this showing on your sales information.

~~(4) The engine must have~~ii) In all other cases, you must get the original manufacturer of the engine to confirm this based on its sales information.

(4) You must ensure that the engine has the label we require under 40 CFR part 86.

(5) ~~A~~You must add a permanent supplemental label to the engine in a position where it will remain clearly visible after installation in the equipment. In ~~your engine's emission control information~~the supplemental label, do the following:

(i) Include the heading: "~~Nonroad Engine Emission Control Information~~NONROAD ENGINE EMISSION CONTROL INFORMATION".

(ii) Include your full corporate name and trademark. You may instead include the full corporate name and trademark of another company you choose to designate.

(iii) State: "~~THIS~~"THIS ENGINE WAS ADAPTED FOR NONROAD USE WITHOUT AFFECTING ITS EMISSION CONTROLS.~~".~~

~~(iv)~~ THE EMISSION-CONTROL SYSTEM DEPENDS ON THE USE OF FUEL MEETING SPECIFICATIONS THAT APPLY FOR MOTOR-VEHICLE APPLICATIONS. OPERATING THE ENGINE ON OTHER FUELS MAY BE A VIOLATION OF FEDERAL LAW.".

(iv) State the date you finished modifying the engine (month and year), if applicable.

(6) The original and supplemental labels must be readily visible after the engine is installed in the equipment or, if the equipment obscures the engine's emission control information label, the equipment manufacturer must attach duplicate labels, as described in 40 CFR 1068.105.

(7) Send the Designated Compliance Officer a signed letter by the end of each calendar year (or less often if we tell you) with all the following information:

(i) Identify your full corporate name, address, and telephone number.

(ii) List the engine models you expect to produce under this exemption in the coming year.

(iii) State: "We produce each listed engine model for nonroad application without making any changes that could increase its certified emission levels, as described in 40 CFR 1048.605.".

(~~d~~e) Failure to comply. If your engines do not meet the criteria listed in paragraph (~~c~~d) of this section, they will be subject to the standards, requirements, and prohibitions of this part 1048 and the certificate issued under 40 CFR part 86 will not be deemed to also be a certificate issued under this part 1048. ~~Producing~~Introducing these engines into commerce without a valid exemption or certificate of conformity ~~would~~under this part violates the prohibitions in 40 CFR 1068.101.

~~(c) If you are the original engine manufacturer of both the highway and nonroad versions of an exempted engine, you must send us emission test data on the applicable nonroad duty cycle(s). You may include the data in your application for certification or in your letter requesting the exemption.~~

~~(f) If you are the original engine manufacturer of an exempted engine that is modified by another company under this exemption, we~~(a)(1).

(f) Data submission. We may require you to send us emission test data on ~~the~~any applicable nonroad duty ~~cycle(s). If we ask for this data, we will allow a reasonable amount of time to collect it.~~

~~(g) The engine exempted~~cycles.

(g) Participation in averaging, banking and trading. Engines adapted for nonroad use under this section ~~must meet all applicable requirements from~~may generate credits under the ABT provisions in 40 CFR part 86. ~~This applies to engine manufacturers, equipment manufacturers who use these engines, and all other persons as if these engines were used in a motor vehicle~~These engines must use emission credits under 40 CFR part 86 if they are certified to an FEL that exceeds an applicable standard under 40 CFR part 86.

§1048.610 What ~~are the~~ provisions ~~for producing nonroad equipment with engines already~~apply to vehicles certified under the motor-vehicle program?

(a) General provisions. If you are a motor-vehicle manufacturer, this section allows you to introduce new nonroad engines or equipment into commerce if the vehicle is already certified to the requirements that apply under 40 CFR parts 85 and 86 for the appropriate model year. If you comply with all of the provisions of this section, we consider the certificate issued under 40 CFR part 86 for each motor vehicle to also be a valid certificate of conformity for the engine under this part 1048 for its model year, without a separate application for certification under the requirements of this part 1048. See §1048.605 for similar provisions that apply to motor-vehicle engines produced for nonroad equipment.

(b) Equipment-manufacturer provisions. If you are not an engine manufacturer, you may produce nonroad equipment from ~~complete or incomplete motor vehicles with~~motor vehicles under this section as long as the equipment has the labels specified in paragraph (d)(5) of this section and you do not make any of the changes described in paragraph (d)(2) of this section. You must also add the fuel-inlet label we specify in §1048.135(e). If you modify the motor vehicle ~~engine if you meet three criteria:~~

~~(a) The engine or vehicle is certified to 40 CFR part 86.~~

~~(b) The engine is not adjusted outside the~~or its engine in any of the ways described in paragraph (d)(2) of this section, we will consider you a manufacturer of a new nonroad engine. Such modifications prevent you from using the provisions of this section.

(c) Liability. Engines, vehicles, and equipment for which you meet the requirements of this section are exempt from all the requirements and prohibitions of this part, except for those specified in this section. Engines exempted under this section must meet all the applicable requirements from 40 CFR parts 85 and 86. This applies to engine ~~manufacturer's specifications (see §1048.605(c)(2)).~~

~~(c) The engine or vehicle is not modified in any way that may affect its emission control. This applies to exhaust and~~manufacturers, equipment manufacturers, and all other persons as if the nonroad equipment were motor vehicles. The prohibited acts of §1068.101(a)(1) apply to these new pieces of equipment; however, we consider the certificate issued under 40 CFR part 86 for each motor vehicle to also be a valid certificate of conformity for the engine under this part 1048 for its model year. If we make a determination that these engines, vehicles, or equipment do not conform to the regulations during their useful life, we may require you to recall them under 40 CFR part 86 or 40 CFR 1068.505.

(d) Specific requirements. If you are a motor-vehicle manufacturer and meet all the following criteria and requirements regarding your new nonroad equipment and its engine, the engine is eligible for an exemption under this section:

(1) Your equipment must be covered by a valid certificate of conformity as a motor vehicle issued under 40 CFR part 86.

(2) You must not make any changes to the certified vehicle that we could reasonably expect to increase its exhaust emissions for any pollutant, or its evaporative ~~emission controls, but not~~emissions if it is subject to evaporative-emission standards. For example, if you make any of the following changes, you do not qualify for this exemption:

(i) Change any fuel system or evaporative system parameters from the certified configuration, including refueling emission controls.

(ii) Change, remove, or fail to properly install any other component, element of design, or calibration specified in the vehicle manufacturer's application for certification. This includes aftertreatment devices and all related components.

(iii) Modify or design the engine cooling system so that temperatures or heat rejection rates are outside the original vehicle manufacturer's specified ranges.

(iv) Add more than 500 pounds to the curb weight of the originally certified motor vehicle.

(3) You must show that fewer than 50 percent of the total sales as a motor vehicle or a piece of nonroad equipment, from all companies, are used in nonroad applications, as follows:

(i) If you are the original manufacturer of the vehicle, base this showing on your sales information.

(ii) In all other cases, you must get the original manufacturer of the vehicle to confirm this based on their sales information.

(4) The equipment must have the vehicle emission control information and fuel labels we require under 40 CFR 86.007-35.

(5) You must add a permanent supplemental label to the equipment in a position where it will remain clearly visible. In the supplemental label, do the following:

(i) Include the heading: "NONROAD ENGINE EMISSION CONTROL INFORMATION".

(ii) Include your full corporate name and trademark. You may instead include the full corporate name and trademark of another company you choose to designate.

(iii) State: "THIS VEHICLE WAS ADAPTED FOR NONROAD USE WITHOUT AFFECTING ITS EMISSION CONTROLS. THE EMISSION-CONTROL SYSTEM DEPENDS ON THE USE OF FUEL MEETING SPECIFICATIONS THAT APPLY FOR MOTOR-VEHICLE APPLICATIONS. OPERATING THE ENGINE ON OTHER FUELS MAY BE A VIOLATION OF FEDERAL LAW.".

(iv) State the date you finished modifying the vehicle (month and year), if applicable.

(6) The original and supplemental labels must be readily visible in the fully assembled equipment.

(7) Send the Designated Compliance Officer a signed letter by the end of each calendar year (or less often if we tell you) with all the following information:

(i) Identify your full corporate name, address, and telephone number.

(ii) List the equipment models you expect to produce under this exemption in the coming year.

(iii) State: "We produced each listed engine or equipment model for nonroad application without making any changes that could increase its certified emission levels, as described in 40 CFR 1048.610.".

(e) Failure to comply. If your engines, vehicles, or equipment do not meet the criteria listed in paragraph (d) of this section, the engines will be subject to the standards, requirements, and prohibitions of this part 1048, and the certificate issued under 40 CFR part 86 will not be deemed to also be a certificate issued under this part 1048. Introducing these engines into commerce without a valid exemption or certificate of conformity under this part violates the prohibitions in 40 CFR 1068.101(a)(1).

(f) Data submission. We may require you to send us emission test data on any applicable nonroad duty cycles.

(g) Participation in averaging, banking and trading. Vehicles adapted for nonroad use under this section may generate credits under the ABT provisions in 40 CFR part 86. These vehicles must use emission credits under 40 CFR part 86 if they are certified to an FEL that exceeds an applicable standard under 40 CFR part 86.

§1048.615 What are the provisions for exempting engines designed for lawn and garden applications?

This section is intended for engines designed for lawn and garden applications, but it applies to any engines meeting the size criteria in paragraph (a) of this section.

(a) If an engine meets all the following criteria, it is exempt from the requirements of this part:

(1) The engine must have a total displacement of 1,000 cc or less.

(2) The engine must have a maximum ~~brake~~engine power ~~of~~at or below 30 kW ~~or less~~.

(3) The engine must be in an engine family ~~-~~that has a valid certificate of conformity showing that it meets emission standards for Class II engines under 40 CFR part 90 for the appropriate model year.

(b) The only requirements or prohibitions from this part that apply to an engine that meets the criteria in paragraph (a) of this section are in this section.

(c) If your engines do not meet the criteria listed in paragraph (a) of this section, they will be subject to the provisions of this part. ~~Producing~~Introducing these engines into commerce without a valid exemption or certificate of conformity ~~would~~ violate~~s~~ the prohibitions in 40 CFR 1068.101.

(d) Engines exempted under this section are subject to all the requirements affecting engines under 40 CFR part 90. The requirements and restrictions of 40 CFR part 90 apply to anyone manufacturing these engines, anyone manufacturing equipment that uses these engines, and all other persons in the same manner as if these engines had a total maximum ~~brake~~engine power at or below 19 kW.

§1048.620 What are the provisions for exempting large engines fueled by natural gas?

(a) If an engine meets all the following criteria, it is exempt from the requirements of this part:

(1) The engine must operate solely on natural gas.

(2) The engine must have maximum ~~brake~~engine power at or above 250 kW ~~or higher~~.

(3) The engine must be in an engine family that has a valid certificate of conformity showing that it meets emission standards for engines of that power rating under 40 CFR part 89 or 1039.

(b) The only requirements or prohibitions from this part that apply to an engine that is exempt under this section are in this section.

(c) If your engines do not meet the criteria listed in paragraph (a) of this section, they will be subject to the provisions of this part. ~~Producing~~Introducing these engines into commerce without a valid exemption or certificate of conformity ~~would~~ violates the prohibitions in 40 CFR 1068.101.

(d) Engines exempted under this section are subject to all the requirements affecting engines under 40 CFR part 89 or 1039. The requirements and restrictions of 40 CFR part 89 or 1039 apply to anyone manufacturing these engines, anyone manufacturing equipment that uses these engines, and all other persons in the same manner as if these were nonroad diesel engines.

(e) You may request an exemption under this section by submitting an application for certification for the engines under 40 CFR part 89 or 1039.~~–~~

§1048.625 What special provisions apply to engines using noncommercial fuels?

~~If you are unable to meet this part's requirements with engines using noncommercial fuels (such as unrefined natural gas released by oil wells), the following provisions apply for those engines.~~

~~(a) Create a separate engine family.~~

~~(b) Disregard the limits on adjustable parameters in~~In §1048.115(e), ~~but make sure~~we generally require th~~e~~at engines meet emission standards ~~with normal settings when the engine is using fuel meeting the specifications of 40 CFR part 1065, subpart C.~~

~~(c~~for any adjustment within the full range of any adjustable parameters. For engines that use noncommercial fuels significantly different than the specified test fuel of the same type, you may ask to use the parameter-adjustment provisions of this section instead of those in §1048.115(e). Engines certified under this section must be in a separate engine family.

(a) If we approve your request, the following provisions apply:

(1) You must certify the engine using the test fuel specified in §1048.501.

(2) You may produce the engine without limits or stops that keep the engine adjusted within the certified range.

(3) You must specify in-use adjustments different than the adjustable settings appropriate for the specified test fuel, consistent with the provisions of paragraph (b)(1) of this section.

(b) To produce engines under this section, you must do the following:

(1) Specify in-use adjustments needed so the engine's level of emission control for each regulated pollutant is equivalent to that from the certified configuration.

(2) Add the following information to the emission control information label specified in §1048.135:

(~~1~~i) Include instructions describing how to adjust the engine to operate in a way that maintains the effectiveness of the emission-control system.

(~~2~~ii) State: "~~THIS~~"THIS ENGINE IS CERTIFIED TO OPERATE IN APPLICATIONS USING NONCOMMERCIAL FUEL. ~~USING IT IN AN APPLICATION INVOLVING ONLY COMMERCIAL FUELS MAY BE~~MALADJUSTMENT OF THE ENGINE IS A VIOLATION OF FEDERAL LAW SUBJECT TO CIVIL PENALTY.".

(~~d~~3) Keep records to document the destinations and quantities of engines produced under this section.

§1048.630 What are the provisions for exempting engines used solely for competition?

The provisions of this section apply for new engines built on or after January 1, 2006.

(a) Equipment manufacturers may use uncertified engines if the vehicles or equipment in which they are installed will be used solely for competition.

(b) The definition of nonroad engine in 40 CFR 1068.30 excludes engines used solely for competition. These engines are not required to comply with this part 1048 or 40 CFR part 89, but 40 CFR 1068.101 prohibits the use of competition engines for noncompetition purposes.

(c) We consider a vehicle or piece of equipment to be one that will be used solely for competition if it has features that are not easily removed that would make its use other than in competition unsafe, impractical, or highly unlikely.

(d) As an engine manufacturer, your engine is exempt without our prior approval if you have a written request for an exempted engine from the equipment manufacturer showing the basis for believing that the equipment will be used solely for competition. You must permanently label engines exempted under this section to clearly indicate that they are to be used solely for competition. Failure to properly label an engine will void the exemption.

(e) We may discontinue an exemption under this section if we find that engines are not used solely for competition.

§1048.635 What special provisions apply to branded engines?

The following provisions apply if you identify the name and trademark of another company instead of your own on your emission control information label, as provided by §1048.135(c)(2):

(a) You must have a contractual agreement with the other company that obligates that company to take the following steps:

(1) Meet the emission warranty requirements that apply under §1048.120. This may involve a separate agreement involving reimbursement of warranty-related expenses.

(2) Report all warranty-related information to the certificate holder.

(b) In your application for certification, identify the company whose trademark you will use and describe the arrangements you have made to meet your requirements under this section.

(c) You remain responsible for meeting all the requirements of this chapter, including warranty and defect-reporting provisions.

Subpart H—[Reserved]

Subpart I—Definitions and Other Reference Information

§1048.801 What definitions apply to this part?

The following definitions apply to this part. The definitions apply to all subparts unless we note otherwise. All undefined terms have the meaning the Act gives to them. The definitions follow:

Act means the Clean Air Act, as amended, 42 U.S.C. ~~7401 et seq~~7401-7671q.

Adjustable parameter means any device, system, or element of design that someone can adjust (including those which are difficult to access) and that, if adjusted, may affect emissions or engine performance during emission testing or normal in-use operation. This includes, but is not limited to, parameters related to injection timing and fueling rate. You may ask us to exclude a parameter that is difficult to access if it cannot be adjusted to affect emissions without significantly degrading engine performance, or if you otherwise show us that it will not be adjusted in a way that affects emissions during in-use operation.

Aftertreatment means relating to a catalytic converter, particulate filter, or any other system, component, or technology mounted downstream of the exhaust valve (or exhaust port) whose design function is to ~~reduce exhaust emissions~~decrease emissions in the engine exhaust before it is exhausted to the environment. Exhaust-gas recirculation (EGR) and turbochargers are not aftertreatment.

Aircraft means any vehicle capable of sustained air travel above treetop heights.

All-terrain vehicle has the meaning we give in 40 CFR 1051.801.

Amphibious vehicle means a vehicle with wheels or tracks that is designed primarily for operation on land and secondarily for operation in water.

Auxiliary emission-control device means any element of design that senses temperature, ~~engine rpm,~~ motive speed, engine RPM, transmission gear~~, atmospheric pressure, manifold pressure or vacuum~~, or any other parameter ~~to activate~~for the purpose of activating, ~~modulate~~modulating, ~~delay~~delaying, or ~~deactivate~~deactivating the operation of any part of the emission-control system. ~~This also includes any other feature that causes in-use emissions to be higher than those measured under test conditions, except as we allow under this part.~~

Blue Sky Series engine means an engine meeting the requirements of §1048.140.

Brake power means the usable power output of the engine, not including power required to ~~operate fuel pumps, oil pumps, or coolant pumps.~~

~~Broker means any entity that facilitates a trade of emission credits between a buyer and seller.~~fuel, lubricate, or heat the engine, circulate coolant to the engine, or to operate aftertreatment devices.

Calibration means the set of specifications and tolerances specific to a particular design, version, or application of a component or assembly capable of functionally describing its operation over its working range.

Certification means obtaining a certificate of conformity for an engine family that complies with the emission standards and requirements in this part.

Certified emission level means the highest deteriorated emission level in an engine family for a given pollutant from either transient or steady-state testing.

Compression-ignition means relating to a type of reciprocating, internal-combustion engine that is not a spark-ignition engine.

Constant-speed engine means an engine ~~governed to operate at a single speed.~~ whose certification is limited to constant-speed operation. Engines whose constant-speed governor function is removed or disabled are no longer constant-speed engines.

Constant-speed operation means engine operation with a governor that controls the operator input to maintain an engine at a reference speed, even under changing load. For example, an isochronous governor changes reference speed temporarily during a load change, then returns the engine to its original reference speed after the engine stabilizes. Isochronous governors typically allow speed changes up to 1.0 %. Another example is a speed-droop governor, which has a fixed reference speed at zero load and allows the reference speed to decrease as load increases. With speed-droop governors, speed typically decreases (3 to 10) % below the reference speed at zero load, such that the minimum reference speed occurs near the engine's point of maximum power.

Crankcase emissions means airborne substances emitted to the atmosphere from any part of the engine crankcase's ventilation or lubrication systems. The crankcase is the housing for the crankshaft and other related internal parts.

Critical emission-related component means any of the following components:

(1) Electronic control units, aftertreatment devices, fuel-metering components, EGR-system components, crankcase-ventilation valves, all components related to charge-air compression and cooling, and all sensors and actuators associated with any of these components.

(2) Any other component whose primary purpose is to reduce emissions.

Designated Compliance Officer means the Manager, Engine Programs Group (6405-J), U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460.

Designated Enforcement Officer means the Director, Air Enforcement Division (2242A), U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW.,Washington, DC 20460.

Deteriorated emission level means the emission level that results from applying the appropriate deterioration factor to the official emission result of the emission-data engine.

Deterioration factor means the relationship between emissions at the end of useful life and emissions at the low-hour test point, expressed in one of the following ways:

(1) For multiplicative deterioration factors, the ratio of emissions at the end of useful life to emissions at the low-hour test point.

(2) For additive deterioration factors, the difference between emissions at the end of useful life and emissions at the low-hour test point.

Discrete-mode means relating to the discrete-mode type of steady-state test described in §1048.505.

Emission-control system means any device, system, or element of design that controls or reduces the regulated emissions from an engine.

Emission-data engine means an engine that is tested for certification. This includes engines tested to establish deterioration factors.

Emission-related maintenance means maintenance that substantially affects emissions or is likely to substantially affect emissions deterioration.

Engine ~~family means a group of engines with similar emission characteristics, as specified~~configuration means a unique combination of engine hardware and calibration within an engine family. Engines within a single engine configuration differ only with respect to normal production variability.

Engine family has the meaning given in §1048.230.

Engine manufacturer means the manufacturer of the engine. See the definition of "manufacturer" in this section.

Equipment manufacturer means a manufacturer of nonroad equipment. All nonroad equipment manufacturing entities under the control of the same person are considered to be a single nonroad equipment manufacturer.

Exempted has the meaning we give in 40 CFR 1068.30.

Excluded means relating to an engine that either:

(1) Has been determined not to be a nonroad engine, as specified in 40 CFR 1068.30; or

(2) Is a nonroad engine that, according to §1048.5, is not subject to this part 1048.

Exhaust-gas recirculation means a technology that reduces emissions by routing exhaust gases that had been exhausted from the combustion chamber(s) back into the engine to be mixed with incoming air before or during combustion. The use of valve timing to increase the amount of residual exhaust gas in the combustion chamber(s) that is mixed with incoming air before or during combustion is not considered exhaust-gas recirculation for the purposes of this part.

Fuel system means all components involved in transporting, metering, and mixing the fuel from the fuel tank to the combustion chamber(s), including the fuel tank, fuel tank cap, fuel pump, fuel filters, fuel lines, carburetor or fuel-injection components, and all fuel-system vents.

Fuel type means a general category of fuels such as gasoline or natural gas. There can be multiple grades within a single fuel type, such as winter-grade and summer-grade gasoline.

Good engineering judgment has the meaning we give in 40 CFR 1068.30. See 40 CFR 1068.5 for the administrative process we use to evaluate good engineering judgment.

High-cost warranted part means a component covered by the emission-related warranty with a replacement cost (at the time of certification) exceeding $400 (in 1998 dollars). Adjust this value using the most recent annual average consumer price index information published by the U.S. Bureau of Labor Statistics. For this definition, replacement cost includes the retail cost of the part plus labor and standard diagnosis.

High-load engine means an engine for which the engine manufacturer can provide clear evidence that operation below 75 percent of maximum load in it's final application will be rare.

Hydrocarbon (HC) means the hydrocarbon group on which the emission standards are based for each fuel type. ~~For gasoline- and LPG-fueled engines, HC means total hydrocarbon (THC). For natural gas-fueled engines, HC means nonmethane hydrocarbon (NMHC). For alcohol-fueled engines, HC means total hydrocarbon equivalent (THCE~~, as described in §1048.101(e).

Identification number means a unique specification (for example, a model number/serial number combination) that allows someone to distinguish a particular engine from other similar engines.

Intermediate test speed has the meaning we give in 40 CFR 1065.515.

Low-hour means relating to an engine with stabilized emissions and represents the undeteriorated emission level. This would generally involve less than 300 hours of operation.

Manufacturer has the meaning given in section 216(1) of the Act. In general, this term includes any person who manufactures an engine, vehicle, or piece of equipment for sale in the United States or otherwise introduces a new nonroad engine into commerce in the United States. This includes importers who import engines, equipment, or vehicles for resale.

Marine engine means ~~an~~a nonroad engine that ~~someone~~is installed or intended to be installed on a marine vessel. This includes a portable auxiliary engine only if its fueling, cooling, or exhaust system is an integral part of the vessel. There are two kinds of marine engines:

(1) Propulsion marine engine means a marine engine that moves a vessel through the water or directs the vessel's movement.

(2) Auxiliary marine engine means a marine engine not used for propulsion.

Marine vessel ~~means a vehicle that is capable of operation in water but is not capable of operation out of water. Amphibious~~has the meaning given in 1 U.S.C. 3, except that it does not include amphibious vehicles ~~are not marine vessels.~~

~~Maximum brake power means the maximum brake power an engine produces at maximum test speed~~. The definition in 1 U.S.C. 3 very broadly includes every craft capable of being used as a means of transportation on water.

Maximum engine power has one of the following meanings:

(1) For engines at or below 30 kW, maximum engine power has the meaning given in 40 CFR 90.2.

(2) For engines above 30 kW, maximum engine power has the meaning given in 40 CFR 1039.140.

Maximum test speed has the meaning we give in 40 CFR 1065.515.

Maximum test torque has the meaning we give in 40 CFR 1065.1001.

Model year means one of the following things:

(1) For freshly manufactured equipment and engines (see definition of "new nonroad engine," paragraph (1)), model year means one of the following:

(i) Calendar year.

(ii) Your annual new model production period if it is different than the calendar year. This must include January 1 of the calendar year for which the model year is named. It may not begin before January 2 of the previous calendar year and it must end by December 31 of the named calendar year.

(2) For an engine that is converted to a nonroad engine after being placed into service ~~in~~as a motor ~~-~~vehicle engine or a stationary engine, model year means the calendar year in which the engine was originally produced (see definition of "new nonroad engine," paragraph (2)).

(3) For a nonroad engine excluded under §1048.5 that is later converted to operate in an application that is not excluded, model year means the calendar year in which the engine was originally produced (see definition of "new nonroad engine," paragraph (3)).

(4) For engines that are not freshly manufactured but are installed in new nonroad equipment, model year means the calendar year in which the engine is installed in the new nonroad equipment~~. This installation date is based on the time that final assembly of the equipment is complete~~ (see definition of "new nonroad engine," paragraph (4)).

(5) ~~For an engine modified by an importer (not the original engine manufacturer) who has a certificate of conformity for the~~For imported ~~engine (see definition of "new nonroad engine," paragraph (5)), model year means one of the following:~~

~~(i) The calendar year in which the importer finishes modifying and labeling the engine.~~

~~(ii) Your annual production period for producing engines if it is different than the calendar year; follow the guidelines in paragraph (1)(ii) of this definition.~~

~~(6) For an engine you import that does not meet the criteria in paragraphs (1) through (5~~engines:

(i) For imported engines described in paragraph (5)(i) of the definition of "new nonroad engine," model year means has the ~~calendar year in which the engine manufacturer completed the original assembly of the engine. In general, this applies to used equipment that you import without conversion or major modification.~~meaning given in paragraphs (1) through (4) of this definition.

(ii) [Reserved]

Motor vehicle has the meaning we give in 40 CFR 85.1703(a). In general, motor vehicle means ~~a self-propelled vehicle that can transport one or more people or any material, but doesn't include any of the following:~~

~~(1) Vehicles having a maximum ground speed over level, paved surfaces no higher than 40 km per hour (25 miles per hour).~~

~~(2) Vehicles that lack features usually needed for safe~~any vehicle that EPA deems to be capable of safe and practical use on streets or ~~highways— for example, safety features required by law, a reverse gear (except for motorcycles), or a differential.~~

~~(3) Vehicles whose operation on streets or highways would be unsafe, impractical, or highly unlikely. Examples are vehicles with tracks instead of wheels, very large size, or features associated with military vehicles, such as armor or weaponry~~highways that has a maximum ground speed above 40 kilometers per hour (25 miles per hour) over level, paved surfaces.

New nonroad engine means any of the following things:

(1) A freshly manufactured nonroad engine for which the ultimate ~~buyer~~purchaser has never received the equitable or legal title. This kind of ~~vehicle~~engine might commonly be thought of as "brand new." In the case of this

paragraph (1), the engine becomes new when it is fully assembled for the first time. The engine is no longer new when the ultimate ~~buyer~~purchaser receives th~~is~~e title or the product is placed into service, whichever comes first.

(2) ~~-~~An engine originally manufactured as a motor~~-~~vehicle engine or a stationary engine that is later intended to be used in a piece of nonroad equipment. In this case, the engine is no longer a motor~~-~~vehicle or stationary engine and becomes a "new nonroad engine"~~.~~ The engine is no longer new when it is placed into nonroad service.

(3) ~~-~~A nonroad engine that has been previously placed into service in an application we exclude under §1048.5, where that engine is installed in a piece of equipment ~~for which these exclusions do not apply~~that is covered by this part 1048. The engine is no longer new when it is placed into nonroad service covered by this part 1048. For example, this would apply to a ~~stationary~~marine-propulsion engine that is no longer used in a ~~stationary application~~marine vessel.~~-~~

(4) ~~-~~An engine not covered by paragraphs (1) through (3) of this definition that is intended to be installed in new nonroad equipment. The engine is no longer new when the ultimate ~~buyer~~purchaser receives a title for the equipment or the product is placed into service, whichever comes first. This generally includes installation of used engines in new equipment.

(5) An imported nonroad engine, subject to the following provisions:

(i) An imported nonroad engine covered by a certificate of conformity issued under this part that meets the criteria of one or more of paragraphs (1) through (4) of this definition, where the original engine manufacturer holds the certificate, is new as defined by those applicable paragraphs.

(ii) An imported nonroad engine covered by a certificate of conformity issued under this part, where someone other than the original engine manufacturer ~~modifies~~holds the certificate (such as when the engine is modified after its initial assembly ~~and holds the certificate~~), becomes new when it is imported. ~~The engine~~It is no longer new when the ultimate purchaser receives a title for the engine or it is placed into ~~nonroad~~ service, whichever comes first.

(~~i~~iii)~~-~~ An imported nonroad engine that is not covered by a certificate of conformity issued under this part at the time of importation is new, but only if it was produced on or after January 1, 2004. This addresses uncertified engines and ~~vehicles that have been~~equipment initially placed into service ~~in other countries and~~ that someone seeks to import into the United States. Importation of this kind of new nonroad engine (or ~~vehicle~~equipment containing such an engine) is generally prohibited by 40 CFR part 1068.

New nonroad equipment means either of the following things:

(1) ~~-~~A nonroad ~~vehicle or other~~ piece of equipment for which the ultimate ~~buyer~~purchaser has never received the equitable or legal title. The product is no longer new when the ultimate ~~buyer~~purchaser receives this title or the product is placed into service, whichever comes first.

(2) ~~-~~An imported nonroad piece of equipment with an engine not covered by a certificate of conformity issued under this part at the time of importation and manufactured after ~~the date for applying the requirements of this part~~January 1, 2004.

Noncommercial fuel means a ~~fuel~~combustible product that is not marketed ~~or sold~~ as a commercial ~~product~~fuel, but is used as a fuel for nonroad engines. For example, this includes methane that is produced and released from landfills or oil wells, or similar unprocessed fuels that are not intended to meet any otherwise applicable fuel specifications. See §1048.615 for provisions related to engines designed to burn noncommercial fuels.

Noncompliant engine means an engine that was originally covered by a certificate of conformity, but is not in the certified configuration or otherwise does not comply with the conditions of the certificate.

Nonconforming engine means an engine not covered by a certificate of conformity that would otherwise be subject to emission standards.

Nonmethane hydrocarbon means the difference between the emitted mass of total hydrocarbons and the emitted mass of methane.

Nonroad means relating to nonroad engines or equipment that includes nonroad engines.

Nonroad engine has the meaning we give~~n~~ in 40 CFR 1068.30. In general this means all ~~internal-combustion~~internal-combustion engines except motor vehicle engines, stationary engines, ~~or~~ engines used solely for competition, or engines used in aircraft. This part does not apply to all nonroad engines (see §1048.5).

Nonroad equipment means a piece of equipment that is powered by one or more nonroad engines.

Off-highway motorcycle has the meaning we give in 40 CFR 1051.801. (Note: highway motorcycles are regulated under 40 CFR part 86.)

Official emission result means the measured emission rate for an emission-data engine on a given duty cycle before the application of any deterioration factor, but after the applicability of regeneration adjustment factors.

Oxides of nitrogen has the meaning ~~given it~~we give in 40 CFR part 1065

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Piece of equipment means any vehicle, vessel, or other type of equipment using engines to which this part applies.

Placed into service means put into initial use~~d~~ for its intended purpose.

Point of first retail sale means the location at which the initial retail sale occurs. This generally means ~~a dealership.~~

~~Revoke means to discontinue the certificate for an engine family. If we revoke a certificate, you must apply for a new certificate before continuing to produce the affected vehicles or engines. This does not apply to vehicles or engines you no longer possess~~an equipment dealership, but may also include an engine seller or distributor in cases where loose engines are sold to the general public for uses such as replacement engines.

Ramped-modal means relating to the ramped-modal type of steady-state test described in §1048.505.

Rated speed means the maximum full-load governed speed for governed engines and the speed of maximum power for ungoverned engines.

Revoke has the meaning we give in 40 CFR 1068.30.

Round means to round numbers according to ~~ASTM E29-02~~ NIST Special Publication 811(incorporated by reference in §1048.810), unless otherwise specified.

Scheduled maintenance means adjusting, repairing, removing, disassembling, cleaning, or replacing components or systems ~~that is~~ periodically ~~needed~~ to keep a part or system from failing ~~or~~, malfunctioning, or wearing prematurely. It also may mean actions you expect are necessary to correct an overt indication of failure or malfunction for which periodic maintenance is not appropriate.

Severe-duty application includes concrete saws, concrete pumps, and any other application where an engine manufacturer can provide clear evidence that the majority of installations need air-cooled engines as a result of operation in a severe-duty environment.

Severe-duty engine means an engine from an engine family in which the majority of engines are installed in severe-duty applications.

Small-volume engine manufacturer means a company with fewer than 200 employees. This includes any employees working for parent or subsidiary companies.

Snowmobile has the meaning we give in 40 CFR 1051.801.

Spark-ignition means relating to a gasoline-fueled engine or any other type of engine with a spark plug (or other sparking device) and with operating characteristics significantly similar to the theoretical Otto combustion cycle. Spark-ignition engines usually use a throttle to regulate intake air flow to control power during normal operation.

~~Stationary engine means an internal combustion engine that is neither a nonroad engine, nor a motor-vehicle engine, nor an engine used solely for competition (see the definition of nonroad engine in 40 CFR 1068.30). In general this includes fixed engines and all portable or transportable engines that stay in a single site at a building, structure, facility, or installation for at least a full year; this does not include an engine installed in equipment that has the ability to propel itself. For year-round sources, a full year is 12 consecutive months. For seasonal sources, a full year is a full annual operating period of at least three months. A seasonal source is a site with engines operating only part of the year for at least two consecutive years. If you replace an engine with one that does the same or similar work in the same place, you may apply the previous engine's service to your calculation for residence time. If you move a stationary engine anytime in its life after it has been in place for at least a full year, it becomes a nonroad engine subject to emission standards unless it stays at the new location for a full year.~~

Steady-state means relating to emission tests in which engine speed and load are held at a finite set of essentially constant values. Steady-state tests are either discrete-mode tests or ramped-modal tests.

Stoichiometry means the proportion of a mixture of air and fuel such that the fuel is fully oxidized with no remaining oxygen. For example, stoichiometric combustion in gasoline engines typically occurs at an air-fuel mass ratio of about 14.7.

Suspend ~~means to temporarily discontinue the certificate for an engine family. If we suspend a certificate, you may not sell vehicles or engines from that engine family unless we reinstate the certificate or approve a new one~~has the meaning we give in 40 CFR 1068.30.

Test engine means an engine in a test sample.

Test sample means the collection of engines selected from the population of an engine family for emission testing.

~~Total hydrocarbon means the combined mass organic compounds measured by our total hydrocarbon test procedure, expressed as a hydrocarbon with a hydrogen-to-carbon mass ratio of 1.85:1.~~

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This may include testing for certification, production-line testing, or in-use testing.

Tier 1 means relating to the emission standards and other requirements that apply beginning with the 2004 model year.

Tier 2 means relating to the emission standards and other requirements that apply beginning with the 2007 model year.

~~Ultimate buyer means ultimate purchaser~~

Total hydrocarbon means the combined mass of organic compounds measured by the specified procedure for measuring total hydrocarbon, expressed as a hydrocarbon with a hydrogen-to-carbon mass ratio of 1.85:1.

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Total hydrocarbon equivalent means the sum of the carbon mass contributions of non-oxygenated hydrocarbons, alcohols and aldehydes, or other organic compounds that are measured separately as contained in a gas sample, expressed as exhaust hydrocarbon from petroleum-fueled ~~engine hydrocarbons~~engines. The hydrogen-to-carbon ratio of the equivalent hydrocarbon is 1.85:1.

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Ultimate purchaser means, with respect to any new nonroad equipment or new nonroad engine, the first person who in good faith purchases such new nonroad equipment or new nonroad engine for purposes other than resale.

United States ~~means~~has the ~~States, the District of Columbia, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, Guam, American Samoa, the U.S. Virgin Islands, and the Trust Territory of the Pacific Islands~~meaning we give in 40 CFR 1068.30.

Upcoming model year means for an engine family the model year after the one currently in production.

U.S.-directed production volume means the number of engine units, subject to the requirements of this part, produced by a manufacturer for which the manufacturer has a reasonable assurance that sale was or will be made to ultimate ~~buyers~~purchasers in the Unites~~d~~ States.

Useful life means the period during which the engine is designed to properly function in terms of reliability and fuel consumption, without being remanufactured, specified as a number of hours of operation or calendar years, whichever comes first. It is the period during which a new nonroad engine is required to comply with all applicable emission standards. See §1048.101(g).

Variable-speed engine ~~-~~means an engine that is not a constant-speed engine.

~~Void means to invalidate a certificate or an exemption. If we void a certificate, all the vehicles produced under that engine family for that model year are considered noncompliant, and you are liable for each vehicle produced under the certificate and may face civil or criminal penalties or both. If we void an exemption, all the vehicles produced under that exemption are considered uncertified (or nonconforming), and you are liable for each vehicle produced under the exemption and may face civil or criminal penalties or both. You may not produce any additional vehicles using the voided exemption.~~ Variable-speed operation means engine operation that does not meet the definition of constant-speed operation.

Void has the meaning we give in 40 CFR 1068.30.

Volatile liquid fuel means any fuel other than diesel or biodiesel that is a liquid at atmospheric pressure and has a Reid Vapor Pressure higher than 2.0 pounds per square inch.

Wide-open throttle means maximum throttle opening. Unless this is specified at a given speed, it refers to maximum throttle opening at maximum speed. For electronically controlled or other engines with multiple possible fueling rates, wide-open throttle also means the maximum fueling rate at maximum throttle opening under test conditions.

We (us, our) means the Administrator of the Environmental Protection Agency and any authorized representatives.

§1048.805 What symbols, acronyms, and abbreviations does this part use?

The following symbols, acronyms, and abbreviations apply to this part:

˚C	degrees Celsius.
ASTM	American Society for Testing and Materials.
cc	cubic centimeters.
CFR	Code of Federal Regulations.
cm	centimeter.
CO	carbon monoxide.
CO_2	carbon dioxide.
EPA	Environmental Protection Agency.
g/kW-hr	grams per kilowatt-hour.

HC	hydrocarbon.
ISO	International Organization for Standardization.
kPa	kilopascals.
kW	kilowatts.
LPG	liquefied petroleum gas.
m	meters.
MIL	malfunction-indicator light.
mm Hg	millimeters of mercury.
NMHC	nonmethane hydrocarbons.
NIST	National Institute of Standards and Technology.
NOx	oxides of nitrogen (NO and NO_2).
psi	pounds per square inch of absolute pressure.
psig	pounds per square inch of gauge pressure.
rpm	revolutions per minute.
SAE	Society of Automotive Engineers.
SI	spark-ignition.
THC	total hydrocarbon.
THCE	total hydrocarbon equivalent.
U.S.C.	United States Code.

§1048.810 What materials does this part reference?

~~We have incorporated by reference the d~~Documents listed in this section have been incorporated by reference into this part. The Director of the Federal Register approved the incorporation by reference as prescribed in 5 U.S.C. 552(a) and 1 CFR part 51. Anyone may inspect copies at the U.S. EPA, Air and Radiation Docket and Information Center, 1301 Constitution Ave., NW., Room B102, EPA West Building, Washington, DC 20460 or ~~the Office of the Federal Register, 800 N. Capitol St., NW., 7th Floor, Suite 700, Washington, DC.~~

~~(a) ASTM~~at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

(a) NIST material. Table 1 of ~~§1048.810~~this section lists material from the ~~American Society for Testing~~National Institute of Standards and ~~Materials~~Technology that we have incorporated by reference. The first column lists the number and name of the material. The second column lists the sections of this part where we reference it. Anyone may purchase copies of these materials from the ~~American Society for Testing and Materials, 100 Barr Harbor Dr., West Conshohocken, PA 19428~~Government Printing Office, Washington, DC 20402 or download them from the Internet at http://physics.nist.gov/Pubs/SP811/. Table 1 follows:

Table 1 of §1048.~~810—ASTM~~810—NIST Materials

Document number and name	Part 1048 reference
~~ASTM E29-02, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications~~NIST Special Publication 811, Guide for the Use of the International System of Units (SI), 1995 Edition.	1048.801

(b) SAE material. Table 2 of ~~§1048.810~~this section lists material from the Society of Automotive Engineering that we have incorporated by reference. The first column lists the number and name of the material. The second column lists the sections of this part where we reference it. Anyone may purchase copies of these materials from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096. Table 2 follows:

Table 2 of §1048.810—SAE Materials

Document number and name	Part 1048 reference
SAE J1930, Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms, revised May 1998.	1048.135
SAE J2260, Nonmetallic Fuel System Tubing with One or More Layers, November 1996.	1048.105

(c) ISO material. Table 3 of §1048.810 lists material from the International Organization for Standardization that we have incorporated by reference. The first column lists the number and name of the material. The second column lists the section of this part where we reference it. Anyone may purchase copies of these materials from the International Organization for Standardization, Case Postale 56, CH-1211 Geneva 20, Switzerland. Table 3 follows:

Table 3 of §1048.810—ISO Materials

Document number and name	Part 1048 reference
ISO 9141-2 Road vehicles—Diagnostic systems— Part 2: CARB requirements for interchange of digital information, February 1994.	1048.110
ISO 14230-4 Road vehicles—Diagnostic systems—Keyword Protocol 2000—Part 4: Requirements for emission-related systems, June 2000.	1048.110

§1048.815 ~~How should I request EPA~~What provisions apply to ~~keep my information~~ confidential information?

(a) Clearly show what you consider confidential by marking, circling, bracketing, stamping, or some other method.

(b) We will store your confidential information as described in 40 CFR part 2. Also, we will disclose it only as specified in 40 CFR part 2. This applies both to any information you send us and to any information we collect from inspections, audits, or other site visits.

(~~b~~c) If you send us a second copy without the confidential information, we will assume it contains nothing confidential whenever we need to release information from it.

(~~c~~d) If you send us information without claiming it is confidential, we may make it available to the public without further notice to you, as described in 40 CFR 2.204.

§1048.820 How do I request a hearing?

~~See~~(a) You may request a hearing under certain circumstances, as described elsewhere in this part. To do this, you must file a written request, including a description of your objection and any supporting data, within 30 days after we make a decision.

(b) For a hearing you request under the provisions of this part, we will approve your request if we find that your request raises a substantial factual issue.

(c) If we agree to hold a hearing, we will use the procedures specified in 40 CFR part 1068, subpart G~~, for information related to hearings~~.

Appendix I to Part 1048—Large Spark-ignition (SI) Transient Cycle for Constant-Speed Engines

The following table shows the transient duty-cycle for constant-speed engines, as described in §1048.510:

Time (s)	Normalized Speed	Normalized Torque
1	58%	5%
2	58%	5%
3	58%	5%
4	58%	5%
5	58%	5%
6	58%	5%
7	58%	5%
8	58%	5%
9	58%	5%
10	58%	5%
11	58%	5%
12	65%	8%
13	72%	9%
14	79%	12%
15	86%	14%
16	93%	16%
17	93%	16%
18	93%	16%
19	93%	16%
20	93%	16%
21	93%	16%
22	93%	16%
23	93%	16%
24	93%	31%
25	93%	30%
26	93%	27%
27	93%	23%
28	93%	24%
29	93%	21%
30	93%	20%
31	93%	18%
32	93%	16%
33	93%	18%
34	93%	16%
35	93%	17%
36	93%	20%
37	93%	20%
38	93%	22%
39	93%	20%
40	93%	17%
41	93%	17%
42	93%	17%
43	93%	16%
44	93%	18%
45	93%	18%
46	93%	21%
47	93%	21%
48	93%	18%
49	94%	24%
50	93%	28%
51	93%	23%
52	93%	19%
53	93%	20%
54	93%	20%
55	93%	29%
56	93%	23%
57	93%	25%
58	93%	23%
59	93%	23%
60	93%	23%
61	93%	22%
62	93%	21%
63	93%	22%
64	93%	30%
65	93%	33%
66	93%	25%
67	93%	29%
68	93%	27%
69	93%	23%
70	93%	21%
71	93%	21%
72	93%	19%
73	93%	20%
74	93%	24%
75	93%	23%
76	93%	21%
77	93%	44%
78	93%	34%
79	93%	28%
80	93%	37%
81	93%	29%
82	93%	27%
83	93%	33%
84	93%	28%
85	93%	22%
86	96%	30%
87	95%	25%
88	95%	17%
89	95%	13%
90	95%	10%
91	95%	9%
92	95%	8%
93	95%	7%
94	95%	7%
95	95%	6%
96	95%	6%
97	93%	37%
98	93%	35%
99	93%	29%
100	93%	23%
101	93%	23%
102	93%	21%
103	93%	20%
104	93%	29%
105	93%	27%
106	93%	26%
107	93%	35%
108	93%	43%
109	95%	35%
110	95%	24%
111	95%	17%
112	95%	13%
113	95%	10%
114	95%	9%
115	95%	8%
116	95%	7%
117	95%	7%
118	95%	6%
119	93%	36%
120	93%	30%
121	93%	25%
122	93%	21%
123	93%	22%
124	93%	19%
125	93%	34%
126	93%	36%
127	93%	31%
128	93%	26%
129	93%	27%
130	93%	22%
131	93%	22%
132	93%	18%
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134	93%	19%
135	93%	19%
136	93%	23%
137	93%	22%
138	93%	20%
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140	93%	20%
141	93%	18%
142	93%	18%
143	93%	16%
144	93%	19%
145	94%	25%
146	93%	30%
147	93%	29%
148	93%	23%
149	93%	24%
150	93%	22%
151	94%	20%
152	93%	17%
153	93%	16%
154	93%	16%
155	93%	15%
156	93%	17%
157	93%	18%
158	93%	20%
159	93%	21%
160	93%	18%
161	93%	17%
162	92%	54%
163	93%	38%
164	93%	29%
165	93%	24%
166	93%	24%
167	93%	24%
168	93%	23%
169	93%	20%
170	93%	20%
171	93%	18%
172	93%	19%
173	93%	19%
174	93%	16%
175	93%	16%
176	93%	16%
177	93%	18%
178	93%	21%
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193	93%	16%
194	93%	17%
195	93%	17%
196	93%	22%
197	93%	19%
198	93%	19%
199	95%	21%
200	95%	16%
201	95%	12%
202	95%	10%
203	96%	8%
204	96%	7%
205	95%	7%
206	96%	7%
207	95%	6%
208	96%	6%
209	96%	6%
210	88%	6%
211	89%	48%
212	93%	34%
213	93%	27%
214	93%	26%
215	93%	25%
216	93%	22%
217	93%	23%
218	93%	21%
219	93%	21%
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235	93%	26%
236	93%	22%
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242	93%	22%
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245	93%	22%
246	95%	22%
247	95%	16%
248	95%	12%
249	95%	10%
250	95%	9%
251	95%	8%
252	96%	7%
253	95%	7%
254	95%	6%
255	92%	42%
256	93%	36%
257	93%	33%
258	92%	60%
259	93%	48%
260	93%	36%
261	93%	30%
262	93%	28%
263	93%	24%
264	93%	24%
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266	93%	23%
267	93%	25%
268	93%	27%
269	93%	29%
270	93%	26%
271	93%	26%
272	93%	21%
273	93%	23%
274	93%	23%
275	94%	23%
276	93%	40%
277	94%	67%
278	93%	46%
279	93%	38%
280	93%	29%
281	93%	28%
282	93%	27%
283	93%	29%
284	93%	28%
285	94%	34%
286	93%	31%
287	93%	30%
288	94%	42%
289	93%	31%
290	93%	29%
291	93%	27%
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318	93%	32%
319	93%	25%
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1195	94%	23%
1196	95%	25%
1197	95%	26%
1198	94%	22%
1199	95%	19%
1200	94%	17%

Appendix II to Part 1048—Large Spark-ignition (SI) Composite Transient Cycle

The following table shows the transient duty-cycle for engines that are not constant-speed engines, as described in §1048.510:

Time (s)	Normalized Speed	Normalized Torque
0	0%	0%
1	0%	0%
2	0%	0%
3	0%	0%
4	0%	0%
5	0%	0%
6	0%	0%
7	0%	0%
8	0%	0%
9	1%	8%
10	6%	54%
11	8%	61%
12	34%	59%
13	22%	46%
14	5%	51%
15	18%	51%
16	31%	50%
17	30%	56%
18	31%	49%
19	25%	66%
20	58%	55%
21	43%	31%
22	16%	45%
23	24%	38%
24	24%	27%
25	30%	33%
26	45%	65%
27	50%	49%
28	23%	42%
29	13%	42%
30	9%	45%
31	23%	30%
32	37%	45%
33	44%	50%
34	49%	52%
35	55%	49%
36	61%	46%
37	66%	38%
38	42%	33%
39	17%	41%
40	17%	37%
41	7%	50%
42	20%	32%
43	5%	55%
44	30%	42%
45	44%	53%
46	45%	56%
47	41%	52%
48	24%	41%
49	15%	40%
50	11%	44%
51	32%	31%
52	38%	54%
53	38%	47%
54	9%	55%
55	10%	50%
56	33%	55%
57	48%	56%
58	49%	47%
59	33%	44%
60	52%	43%
61	55%	43%
62	59%	38%
63	44%	28%
64	24%	37%
65	12%	44%
66	9%	47%
67	12%	52%
68	34%	21%
69	29%	44%
70	44%	54%
71	54%	62%
72	62%	57%
73	72%	56%
74	88%	71%
75	100%	69%
76	100%	34%
77	100%	42%
78	100%	54%
79	100%	58%
80	100%	38%
81	83%	17%
82	61%	15%
83	43%	22%
84	24%	35%
85	16%	39%
86	15%	45%
87	32%	34%
88	14%	42%
89	8%	48%
90	5%	51%
91	10%	41%
92	12%	37%
93	4%	47%
94	3%	49%
95	3%	50%
96	4%	49%
97	4%	48%
98	8%	43%
99	2%	51%
100	5%	46%
101	8%	41%
102	4%	47%
103	3%	49%
104	6%	45%
105	3%	48%
106	10%	42%
107	18%	27%
108	3%	50%
109	11%	41%
110	34%	29%
111	51%	57%
112	67%	63%
113	61%	32%
114	44%	31%
115	48%	54%
116	69%	65%
117	85%	65%
118	81%	29%
119	74%	21%
120	62%	23%
121	76%	58%
122	96%	75%
123	100%	77%
124	100%	27%
125	100%	79%
126	100%	79%
127	100%	81%
128	100%	57%
129	99%	52%
130	81%	35%
131	69%	29%
132	47%	22%
133	34%	28%
134	27%	37%
135	83%	60%
136	100%	74%
137	100%	7%
138	100%	2%
139	70%	18%
140	23%	39%
141	5%	54%
142	11%	40%
143	11%	34%
144	11%	41%
145	19%	25%
146	16%	32%
147	20%	31%
148	21%	38%
149	21%	42%
150	9%	51%
151	4%	49%
152	2%	51%
153	1%	58%
154	21%	57%
155	29%	47%
156	33%	45%
157	16%	49%
158	38%	45%
159	37%	43%
160	35%	42%
161	39%	43%
162	51%	49%
163	59%	55%
164	65%	54%
165	76%	62%
166	84%	59%
167	83%	29%
168	67%	35%
169	84%	54%
170	90%	58%
171	93%	43%
172	90%	29%
173	66%	19%
174	52%	16%
175	49%	17%
176	56%	38%
177	73%	71%
178	86%	80%
179	96%	75%
180	89%	27%
181	66%	17%
182	50%	18%
183	36%	25%
184	36%	24%
185	38%	40%
186	40%	50%
187	27%	48%
188	19%	48%
189	23%	50%
190	19%	45%
191	6%	51%
192	24%	48%

193	49%	67%
194	47%	49%
195	22%	44%
196	25%	40%
197	38%	54%
198	43%	55%
199	40%	52%
200	14%	49%
201	11%	45%
202	7%	48%
203	26%	41%
204	41%	59%
205	53%	60%
206	44%	54%
207	22%	40%
208	24%	41%
209	32%	53%
210	44%	74%
211	57%	25%
212	22%	49%
213	29%	45%
214	19%	37%
215	14%	43%
216	36%	40%
217	43%	63%
218	42%	49%
219	15%	50%
220	19%	44%
221	47%	59%
222	67%	80%
223	76%	74%
224	87%	66%
225	98%	61%
226	100%	38%
227	97%	27%
228	100%	53%
229	100%	72%
230	100%	49%
231	100%	4%
232	100%	13%
233	87%	15%
234	53%	26%
235	33%	27%
236	39%	19%
237	51%	33%
238	67%	54%
239	83%	60%
240	95%	52%
241	100%	50%
242	100%	36%
243	100%	25%
244	85%	16%
245	62%	16%
246	40%	26%
247	56%	39%
248	81%	75%
249	98%	86%
250	100%	76%
251	100%	51%
252	100%	78%
253	100%	83%
254	100%	100%
255	100%	66%
256	100%	85%
257	100%	72%
258	100%	45%
259	98%	58%
260	60%	30%
261	43%	32%
262	71%	36%
263	44%	32%
264	24%	38%
265	42%	17%
266	22%	51%
267	13%	53%
268	23%	45%
269	29%	50%
270	28%	42%
271	21%	55%
272	34%	57%
273	44%	47%
274	19%	46%
275	13%	44%
276	25%	36%
277	43%	51%
278	55%	73%
279	68%	72%
280	76%	63%
281	80%	45%
282	83%	40%
283	78%	26%
284	60%	20%
285	47%	19%
286	52%	25%
287	36%	30%
288	40%	26%
289	45%	34%
290	47%	35%
291	42%	28%
292	46%	38%
293	48%	44%
294	68%	61%
295	70%	47%
296	48%	28%
297	42%	22%
298	31%	29%
299	22%	35%
300	28%	28%
301	46%	46%
302	62%	69%
303	76%	81%
304	88%	85%
305	98%	81%
306	100%	74%
307	100%	13%
308	100%	11%
309	100%	17%
310	99%	3%
311	80%	7%
312	62%	11%
313	63%	11%
314	64%	16%
315	69%	43%
316	81%	67%
317	93%	74%
318	100%	72%
319	94%	27%
320	73%	15%
321	40%	33%
322	40%	52%
323	50%	50%
324	11%	53%
325	12%	45%
326	5%	50%
327	1%	55%
328	7%	55%
329	62%	60%
330	80%	28%
331	23%	37%
332	39%	58%
333	47%	24%
334	59%	51%
335	58%	68%
336	36%	52%
337	18%	42%
338	36%	52%
339	59%	73%
340	72%	85%
341	85%	92%
342	99%	90%
343	100%	72%
344	100%	18%
345	100%	76%
346	100%	64%
347	100%	87%
348	100%	97%
349	100%	84%
350	100%	100%
351	100%	91%
352	100%	83%
353	100%	93%
354	100%	100%
355	94%	43%
356	72%	10%
357	77%	3%
358	48%	2%
359	29%	5%
360	59%	19%
361	63%	5%
362	33%	2%
363	24%	3%
364	28%	2%
365	36%	16%
366	54%	23%
367	60%	10%
368	33%	1%
369	23%	0%
370	16%	0%
371	11%	0%
372	20%	0%
373	25%	2%
374	40%	3%
375	33%	4%
376	34%	5%
377	46%	7%
378	57%	10%
379	66%	11%
380	75%	14%
381	79%	11%
382	80%	16%
383	92%	21%
384	99%	16%
385	83%	2%
386	71%	2%
387	69%	4%
388	67%	4%
389	74%	16%
390	86%	25%
391	97%	28%
392	100%	15%
393	83%	2%
394	62%	4%
395	40%	6%
396	49%	10%
397	36%	5%
398	27%	4%
399	29%	3%
400	22%	2%
401	13%	3%
402	37%	36%

403	90%	26%
404	41%	2%
405	25%	2%
406	29%	2%
407	38%	7%
408	50%	13%
409	55%	10%
410	29%	3%
411	24%	7%
412	51%	16%
413	62%	15%
414	72%	35%
415	91%	74%
416	100%	73%
417	100%	8%
418	98%	11%
419	100%	59%
420	100%	98%
421	100%	99%
422	100%	75%
423	100%	95%
424	100%	100%
425	100%	97%
426	100%	90%
427	100%	86%
428	100%	82%
429	97%	43%
430	70%	16%
431	50%	20%
432	42%	33%
433	89%	64%
434	89%	77%
435	99%	95%
436	100%	41%
437	77%	12%
438	29%	37%
439	16%	41%
440	16%	38%
441	15%	36%
442	18%	44%
443	4%	55%
444	24%	26%
445	26%	35%
446	15%	45%
447	21%	39%
448	29%	52%
449	26%	46%
450	27%	50%
451	13%	43%
452	25%	36%
453	37%	57%
454	29%	46%
455	17%	39%
456	13%	41%
457	19%	38%
458	28%	35%
459	8%	51%
460	14%	36%
461	17%	47%
462	34%	39%
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468	53%	67%
469	29%	69%
470	19%	65%
471	52%	45%
472	61%	79%
473	29%	70%
474	15%	53%
475	15%	60%
476	52%	40%
477	50%	61%
478	13%	74%
479	46%	51%
480	60%	73%
481	33%	84%
482	31%	63%
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485	23%	63%
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487	28%	57%
488	16%	67%
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490	47%	73%
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499	42%	69%
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502	17%	59%
503	45%	53%
504	21%	62%
505	31%	60%
506	53%	68%
507	48%	79%
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509	51%	47%
510	41%	48%
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512	21%	62%
513	50%	52%
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515	23%	65%
516	42%	62%
517	57%	80%
518	66%	81%
519	64%	62%
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524	41%	53%
525	45%	72%
526	48%	73%
527	46%	90%
528	56%	76%
529	64%	76%
530	69%	64%
531	72%	59%
532	73%	58%
533	71%	56%
534	66%	48%
535	61%	50%
536	55%	56%
537	52%	52%
538	54%	49%
539	61%	50%
540	64%	54%
541	67%	54%
542	68%	52%
543	60%	53%
544	52%	50%
545	45%	49%
546	38%	45%
547	32%	45%
548	26%	53%
549	23%	56%
550	30%	49%
551	33%	55%
552	35%	59%
553	33%	65%
554	30%	67%
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556	25%	58%
557	23%	56%
558	22%	57%
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562	35%	62%
563	21%	80%
564	28%	65%
565	7%	74%
566	23%	54%
567	38%	54%
568	14%	78%
569	38%	58%
570	52%	75%
571	59%	81%
572	66%	69%
573	54%	44%
574	48%	34%
575	44%	33%
576	40%	40%
577	28%	58%
578	27%	63%
579	35%	45%
580	20%	66%
581	15%	60%
582	10%	52%
583	22%	56%
584	30%	62%
585	21%	67%
586	29%	53%
587	41%	56%
588	15%	67%
589	24%	56%
590	42%	69%
591	39%	83%
592	40%	73%
593	35%	67%
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595	30%	65%
596	30%	72%
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598	66%	58%
599	62%	71%
600	36%	63%
601	17%	59%
602	16%	50%
603	16%	62%
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605	51%	66%
606	35%	74%
607	15%	56%
608	19%	54%
609	43%	65%
610	52%	80%
611	52%	83%
612	49%	57%

613	48%	46%
614	37%	36%
615	25%	44%
616	14%	53%
617	13%	64%
618	23%	56%
619	21%	63%
620	18%	67%
621	20%	54%
622	16%	67%
623	26%	56%
624	41%	65%
625	28%	62%
626	19%	60%
627	33%	56%
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629	24%	79%
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631	40%	57%
632	40%	58%
633	28%	44%
634	25%	41%
635	29%	53%
636	31%	55%
637	26%	64%
638	20%	50%
639	16%	53%
640	11%	54%
641	13%	53%
642	23%	50%
643	32%	59%
644	36%	63%
645	33%	59%
646	24%	52%
647	20%	52%
648	22%	55%
649	30%	53%
650	37%	59%
651	41%	58%
652	36%	54%
653	29%	49%
654	24%	53%
655	14%	57%
656	10%	54%
657	9%	55%
658	10%	57%
659	13%	55%
660	15%	64%
661	31%	57%
662	19%	69%
663	14%	59%
664	33%	57%
665	41%	65%
666	39%	64%
667	39%	59%
668	39%	51%
669	28%	41%
670	19%	49%
671	27%	54%
672	37%	63%
673	32%	74%
674	16%	70%
675	12%	67%
676	13%	60%
677	17%	56%
678	15%	62%
679	25%	47%
680	27%	64%
681	14%	71%
682	5%	65%
683	6%	57%
684	6%	57%
685	15%	52%
686	22%	61%
687	14%	77%
688	12%	67%
689	12%	62%
690	14%	59%
691	15%	58%
692	18%	55%
693	22%	53%
694	19%	69%
695	14%	67%
696	9%	63%
697	8%	56%
698	17%	49%
699	25%	53%
700	14%	70%
701	12%	60%
702	22%	57%
703	27%	67%
704	29%	68%
705	34%	62%
706	35%	61%
707	28%	78%
708	11%	71%
709	4%	58%
710	5%	58%
711	10%	56%
712	20%	63%
713	13%	76%
714	11%	65%
715	9%	60%
716	7%	55%
717	8%	53%
718	10%	60%
719	28%	53%
720	12%	73%
721	4%	64%
722	4%	61%
723	4%	61%
724	10%	56%
725	8%	61%
726	20%	56%
727	32%	62%
728	33%	66%
729	34%	73%
730	31%	61%
731	33%	55%
732	33%	60%
733	31%	59%
734	29%	58%
735	31%	53%
736	33%	51%
737	33%	48%
738	27%	44%
739	21%	52%
740	13%	57%
741	12%	56%
742	10%	64%
743	22%	47%
744	15%	74%
745	8%	66%
746	34%	47%
747	18%	71%
748	9%	57%
749	11%	55%
750	12%	57%
751	10%	61%
752	16%	53%
753	12%	75%
754	6%	70%
755	12%	55%
756	24%	50%
757	28%	60%
758	28%	64%
759	23%	60%
760	20%	56%
761	26%	50%
762	28%	55%
763	18%	56%
764	13%	52%
765	11%	59%
766	16%	59%
767	34%	54%
768	16%	82%
769	13%	64%
770	36%	53%
771	45%	64%
772	41%	59%
773	34%	50%
774	27%	45%
775	22%	52%
776	18%	55%
777	26%	54%
778	39%	62%
779	37%	71%
780	32%	58%
781	24%	48%
782	14%	59%
783	7%	59%
784	7%	55%
785	18%	49%
786	40%	62%
787	44%	73%
788	41%	68%
789	35%	48%
790	29%	54%
791	22%	69%
792	46%	53%
793	59%	71%
794	69%	68%
795	75%	47%
796	62%	32%
797	48%	35%
798	27%	59%
799	13%	58%
800	14%	54%
801	21%	53%
802	23%	56%
803	23%	57%
804	23%	65%
805	13%	65%
806	9%	64%
807	27%	56%
808	26%	78%
809	40%	61%
810	35%	76%
811	28%	66%
812	23%	57%
813	16%	50%
814	11%	53%
815	9%	57%
816	9%	62%
817	27%	57%
818	42%	69%
819	47%	75%
820	53%	67%
821	61%	62%
822	63%	53%

823	60%	54%
824	56%	44%
825	49%	39%
826	39%	35%
827	30%	34%
828	33%	46%
829	44%	56%
830	50%	56%
831	44%	52%
832	38%	46%
833	33%	44%
834	29%	45%
835	24%	46%
836	18%	52%
837	9%	55%
838	10%	54%
839	20%	53%
840	27%	58%
841	29%	59%
842	30%	62%
843	30%	65%
844	27%	66%
845	32%	58%
846	40%	56%
847	41%	57%
848	18%	73%
849	15%	55%
850	18%	50%
851	17%	52%
852	20%	49%
853	16%	62%
854	4%	67%
855	2%	64%
856	7%	54%
857	10%	50%
858	9%	57%
859	5%	62%
860	12%	51%
861	14%	65%
862	9%	64%
863	31%	50%
864	30%	78%
865	21%	65%
866	14%	51%
867	10%	55%
868	6%	59%
869	7%	59%
870	19%	54%
871	23%	61%
872	24%	62%
873	34%	61%
874	51%	67%
875	60%	66%
876	58%	55%
877	60%	52%
878	64%	55%
879	68%	51%
880	63%	54%
881	64%	50%
882	68%	58%
883	73%	47%
884	63%	40%
885	50%	38%
886	29%	61%
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